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The Canadian Geographical Society

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As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—first of Canada, then of the British Empire and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is three dollars in Canada.

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.

CANADIAN GEOGRAPHICAL JOURNAL

Editor - *Gordon M. Dallyn*

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This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

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The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1936.

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REFRIGERATION--- THE SILENT SERVICE

by **ALLAN C. MacNEISH**

Laboratory for constant testing of products is an important part of quick-freezing operations.

SINCE primitive days in the history of the world, food preservation has been of prime importance. In the earliest days this was done in a small scale to serve family or clan needs. In more recent days, with the development of the division of labour, and the growth in urbanization, it created the necessity for scientific farming, proper processing and storing, and suitable distribution.

The first big effort made in food preservation was initiated by Napoleon Bonaparte, through the necessity for feeding his huge army. This later resulted in the invention of bottled and canned foods. But there were weaknesses in this system, due to cost of packing, and the loss of much of the vitamin content; and the age-old practice of preserving by cooling was developed on a commercial scale.

This cooling, or refrigeration, was cheap, as no costly packaging was required. It had the added virtue of successful preservation qualities. And these singular characteristics of refrigeration have been developed by modern scientific research to enable food to be preserved over long periods of time, with full flavour, full vitamin content, and sound physical properties.

The long winter months and the large natural ice harvest have given credence to a belief in some parts of Canada that natural refrigeration could supply our wants, and that artificial refrigeration, although good in its way, is only of interest in those lands where the climate is more temperate. This was our national policy until about 1890, and it resulted in the destruction of huge food supplies through the lack of ice after a short winter. It made our fish unpalatable more than a hundred miles from port. It created a decided loss in nutritious value of food after a few days in storage. And even when there was a large supply of ice there was no way of controlling the temperature to suit the various kinds of food. To save our farming and fishing industries, and to satisfy the food demands of the people, the very natural consequence was the subsidizing and sponsoring of cold storage construction by the Federal Government.

From its humble beginning in the early 1890's, refrigeration has blossomed out scientifically and commercially. Its scope now embraces practically our entire food supply, from harvesting to ultimate consumption; the production of the clothes we wear; the beverages we drink; the cut flowers in the florists' stores; our winter sports arenas; the manufacture of aeroplanes; the construction of large engineering structures; our chemical and drug supplies; and many and diverse uses in hospitals and other places.

Scientific Beginning

About fifty years before Nicholas Appert won the 12,000-franc reward from the French Government for his canning operation, Dr. William Cullen, a Glasgow medico-scientist, invented a vacuum machine for the removal of heat. Dr. Cullen's invention was commercialized about 175 years later with the introduction of the water vapour, or steam-jet, principle of refrigeration; and the first machine of this nature was installed in Canada in 1940.

The discovery of Dr. Cullen gained little recognition due to our failure to utilize and develop it commercially. It was not until the middle of the last century that the first important practical step in modern mechanical refrigeration was made, when William Thompson (later Lord Kelvin),

a young Glasgow professor, noted the effects of water evaporation at certain temperatures. By experimentation, Kelvin gasified chemicals at temperatures below the freezing point of water, and developed a basic law for producing refrigeration. His name is preserved in this respect by one of the larger manufacturers of refrigerators — Kelvinator.

What Refrigeration Is

Modern refrigeration signifies the adjustment of temperatures to a low degree by removing heat, with the aid of a mechanical apparatus. This equipment may be designed in any one of a variety of ways, with the complete unit known as a refrigerating machine.

It does no more than remove the heat, as heat is indestructible, and is present in all matter to some degree. The state where there is a total lack of heat, and where molecular motion ceases — a condition never yet realized — has been set arbitrarily by scientists at 459.67 degrees below zero Fahrenheit.

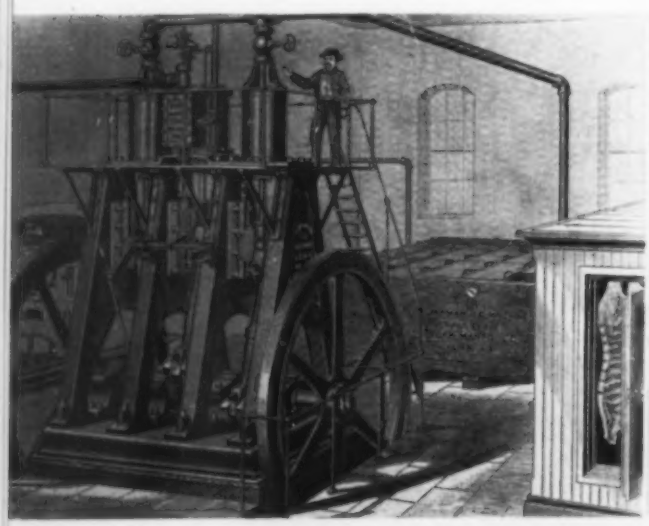
What It Does

Studies have shown that bacteria, which are present in all living and growing matter, are effectively curbed in growth and activity by inherent natural agents. But as soon as food is harvested, and the natural protective agents removed, the bacteria increase to stupendous multitudes.

All biological material has the tendency to decompose through bacterial and autolytic action — enzymic self-digestion. This chemical breaking down by the action of enzymes particularly affects fish, bacon, cheese, butter and meats, by dissolving the proteins, carbo-hydrates and fats; while bacterial action starts decomposition of the food. This results in moulds, taints, off-flavours, odours, and makes a dry, pulpy, tasteless food.

That lowered temperature has a decided dampening effect on the proclivity of these microscopical agents of destruction has been well illustrated in some popular cases within recent years. As reported in such authoritative journal as that of the American Philosophical Society, mammoths discovered deep in the ice-fields of Siberia were found to be quite edible when removed. On the other hand, the fact that cooling does not necessarily kill is exemplified in the recurrence of the fly and mosquito plagues each year in the Upper MacKenzie River district; and by the luxurious fruitful growth of vegetation in the Arctic regions.

The inhibition effect of refrigeration was recently demonstrated by experiments conducted by Prof. M. Levine at Ohio State College on *Bacterium Coli*, a species that is present in the human intestinal tract. This showed that a single cell would only develop to four in twenty-four hours at 50 degrees Fahrenheit, while at 71 degrees its progeny would be 9,500,000 over the same period of time; and at 83 degrees the progeny of a single bacterium would create the huge population of 890,000 million. This population in the space of twenty-four hours at 83 degrees Fahrenheit compared with 212 organisms in four days at 50 degrees Fahrenheit.



Bottom left:—The "Jarman Ice Machine" built 1885-90 by York and used for ice making and beef cooling. This is the first type of refrigerating machine ever built by York, (steam driven). It had a capacity of 10 tons or more of ice per 24 hours.
Courtesy York Ice Mach. Corp.

Bottom right: — An early type of unit for a domestic refrigerator.
Courtesy Kelvinator of Canada, Ltd.

This definite indication of inhibition by cooling varies in degree and complexity with the different types of bacteria. In the case of our Atlantic Coast fisheries, the fish — cod, haddock, halibut, flounder, etc. — have to be preserved at a particularly low temperature as their organisms are acclimatized to temperatures just above the freezing point. The bacteria from the slime and feces of the fish have been known to proliferate at zero temperature, and during gutting, the soft nature of the tissue allows for easy penetration of the bacteria, causing rapid spoilage.

Extreme care must always be exercised that the temperature is sufficient for inhibition of bacterial growth and at the same time is not too low to affect the tender tissues of the food, which have a tendency to disrupt after certain temperatures, causing physical changes and chemical reactions. Thus it is that practically all foods have different optimum storage temperatures. This optimum has to be preserved within one to two degree variations to insure ideal results.

Other Factors

Modern research and practice in food preservation have shown the necessity for proper relative humidity conditions and air circulation in the cold storage of many foods, especially eggs, fruits and vegetables. This removes all dead air spaces in the room, prevents dehydration, and permits equal distribution of the cooling effect.

Another important modern development is the proper protection of the food from chemical changes induced by the oxygen of the air and microbial precipitation of moisture on the surfaces. In the case of fish this is accomplished by glazing — dipping the fish in a cold bath to produce a fine film of ice over the food. A new process for meats and fowl is to enclose the carcasses in a vacuum-tight thin rubber bag. And in the case of small quantities of other foods a moisture-proof wrapping is generally used. Poor packaging causes the loss of vitamin content and results in a poor quality of product.

As refrigeration is not a bactericidal agent, although it may destroy and segregate bacteria during processing and freezing, it is sometimes necessary to drastically curb their influence prior to preservation of the food. This is usually done by blanching —scalding—the food, although this practice is limited to certain foods. With other foods it would give a cooked, discoloured and off-flavour effect. Another most effective, but not yet commercially popular, bactericidal agent is the *Sterilamp*, which controls both moulds and bacteria by ultra-violet radiation. And as protection against mould and bacteria in cold storages, the most commonly used agent is ozone.

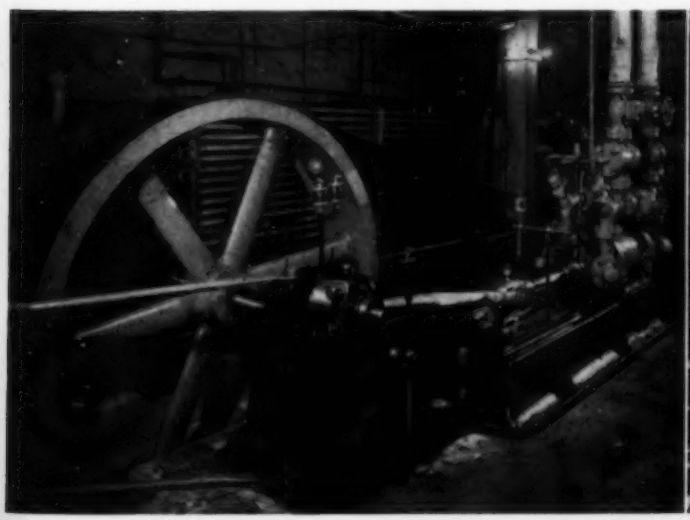
Types of Refrigeration

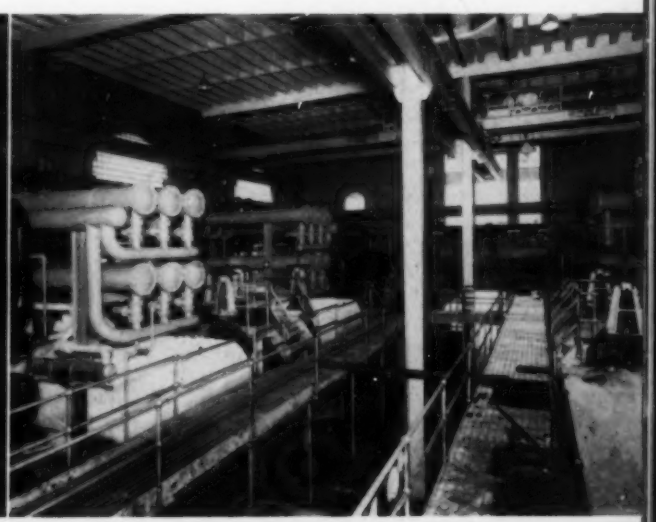
To suit the large variety of foods that are preserved by refrigeration, any one of four treatments may be used. These are: (a) cooling above freezing to preserve the food; (b) frozen products, such as ice-cream, poultry, meats and fish; (c) sharp freezing; and (d) quick-freezing.

The first treatment is utilized where any temperature at or below freezing would

Bottom left:—This 10-ton refrigerating compressor was installed by "Linde" in 1897 and is still operating. It is probably the oldest operating refrigeration unit in Canada in a food storage plant.
Courtesy W. Clark, Ltd.

Bottom right:—Refrigerating machinery for air conditioning in an industrial plant—a 6,000 h.p. installation—largest single installation of refrigeration for air conditioning in the world.
Courtesy York Ice Mach. Corp.





tend to harm the food; and may be used with most fruits and vegetables. The second is a slow process that may last twenty-four hours or longer, with the food frozen to a desired temperature. Sharp-freezing is a low temperature form of freezing, generally from minus 10 to minus 30 degrees Fahrenheit.

Quick-freezing, a comparatively new treatment that has had extraordinary success, is based on the chemical law which states that the size of ice crystals is comparative to the time of freezing. The longer the freezing period, the larger will be the crystals.

As plant and animal tissues are composed of minute cells which crystallize on freezing, slow freezing may enlarge the cells to several times the original size. On thawing, the colloidal gel in the cell has the tendency to completely precipitate, resulting in the separation of the liquid and cell, and causing off-flavour and discolouration. This is more apparent in plant cells as they are inelastic, while animal cells are elastic.

Quick-freezing may cause a breakdown in the plant cell, but no precipitation takes place. A coagulation is effected instead, resulting in a stiffening of the liquid in the cell, and the retaining of full flavour and appearance.

A division is also made in refrigeration engineering into three separate groups: the industrial, commercial and domestic. Or it may be divided into two groups: the high-pressure and the low-pressure.

Industrial refrigeration deals with industrial plants; commercial includes showcases, ice-cream cabinets; water, milk and beverage coolers, and others of a small or boxed nature. Domestic refrigeration covers domestic cabinet units.

High-pressure refrigeration is used where a low temperature is required, such as in industrial plants. And ammonia, which has a very high refrigerating effect, is utilized for this work. Low-pressure refrigeration is used mostly in commercial and domestic units, where low temperatures are not required, and where carbon-dioxide, "Freon", ethyl-chloride, methyl-chloride, sulphur-dioxide or any other refrigerant with a low pressure refrigerating effect may be employed.

Canadian Beginning

Prior to the introduction of mechanical refrigeration in Canada, cooling was generally obtained in industrial plants by placing blocks of natural ice around the rooms. These blocks were usually separated and insulated by sawdust or wood-shavings, with a rough wall of slatted panel-boarding protecting the front.

By the year 1895 there were about four refrigerating machines in the country, installed in Montreal and Toronto, and purchased in Great Britain and at the Chicago Fair. This year also marked the turning point in our acceptance of these machines; principally due to the erection of a tariff barrier by the United States on the export of Canadian perishable foods via U.S. ports. It resulted in the Federal Government making a careful study of ways and means for the protection of these foods, to prevent heavy fluctuations in prices due to marketing difficulties, and to prevent undue waste. It was also considered advisable to have a company in Canada manufacturing refrigerating machinery, and, at the same time, assist the Government in an advisory capacity.

The following year, Professor Robertson, then Dominion Dairy Commissioner, influenced the newly elected Laurier Government to provide subsidies to cold storage and freezing plants. And the first company to manufacture refrigerating machinery was formed by C. W. Vollman. Mr. Vollman had visited Canada the previous year, as chief engineer of the British Linde Refrigeration Company, and on returning in 1896, the Linde Canadian Refrigeration Company was formed, of which he was, and still is, the president.

This resulted in the construction of new cold storages and packing plants in Montreal, Toronto and Quebec City during the next few years, then in the smaller farming and fishing communities, and in the other parts of the Dominion. The Government also assisted in sponsoring rail and steamship freight of perishable foods, making it possible to connect the sources of supply with the large distribution centres in the Dominion, and placing the dairy, packing and fishing industries in a position to successfully compete in the world's markets.

There are now over 400 cold storage plants scattered over the country, as well

as many freezers and many small plants; there are also approximately 47 plants manufacturing artificial ice to an annual value of around $1,580,000; about 145 meat-packing plants and abattoirs producing goods of an annual value of over $157,000,000; about 73 breweries producing beer and ale to a value of $40,000,000 annually; and the fishing industry production totals over $25,000,000 per year. These industries, serviced by refrigeration, employ many thousands of Canadians, and make a most important tribute to our national wealth.

Refrigeration in Industry
Fishing

The fishing industry has benefited to a great extent through refrigerated bait freezers, cold storages, and artificial ice plants to supply fishing boats. Slow freezing was the sole method of preserving fish by refrigeration until 1916, when the first quick-freeze plant was installed. But it was not until successive experiments at the various plants, and at the Dominion Biological Stations that a suitable quick-freeze system was developed by Dr. Huntsman and Dr. Leim in 1927-28. In 1929 the "Birds Eye" system of quick-freezing was introduced into Canada, and this has been the most successful of the fifteen different systems so far tried out.

The recent growth in utilization of refrigeration in this industry may be seen in the following table:

(1), (2), (3) Refrigeration conserves meat vitamins and supplies, and, in feeding communities and nations, plays an increasingly important part.

(4), (5) New plant of Swift Canadian Co. Ltd., at St. Boniface, Manitoba. Inclined walkway for cattle. Cattle walk to top of building, are slaughtered, processed on way down and frozen, then shipped from ground floor.

Photos courtesy Swift Canadian Co., Ltd.

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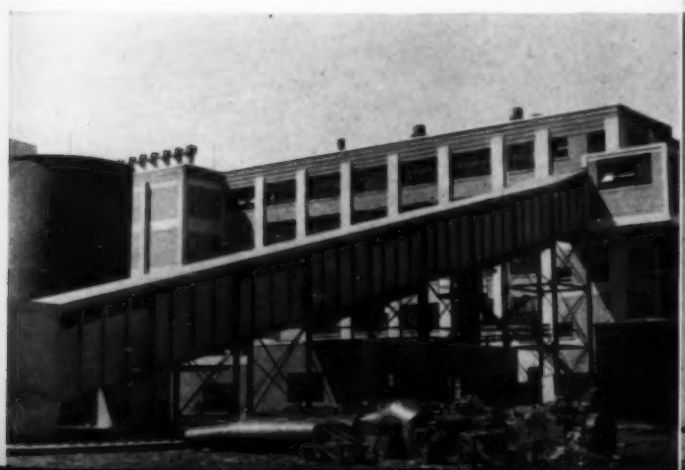
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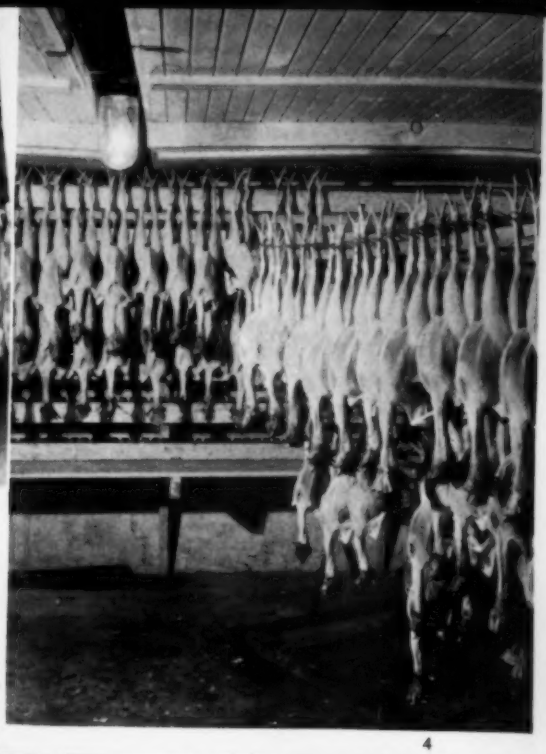

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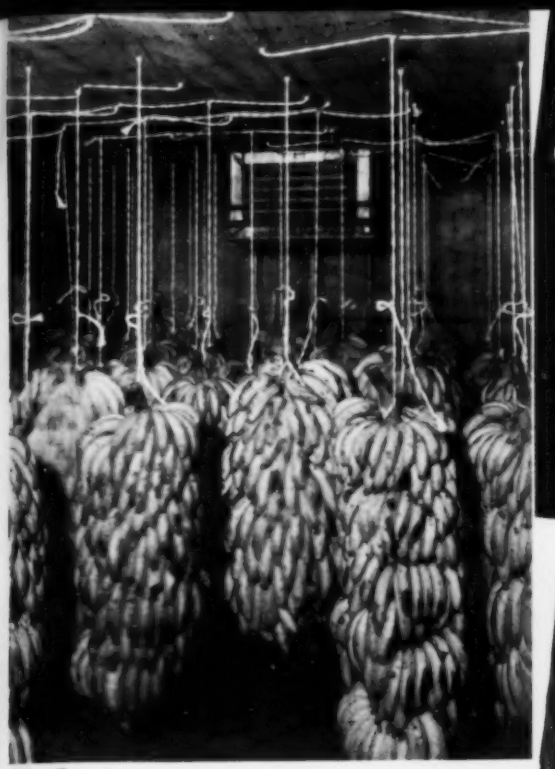

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(1) Beef cooling room. Courtesy Canada Packers Limited

(2) Domestic refrigerators ready for shipment. Courtesy Canadian General Electric Co., Ltd.

(3) Vegetable cooler. Courtesy Canadian General Electric Co., Ltd.

(4) Interior of product cooler, Ontario Poultry Buyers Co-operative Ltd., Toronto. Refrigerated by bare pipe coil and 3 h.p. water-cooled condensing unit. Courtesy Canadian General Electric Co., Ltd.

(5) Cold storage for apples, etc., at Collingwood, Ont. Courtesy J. H. Lock & Sons, Ltd.

(6) Frozen salmon in a modern storage plant. Courtesy Provincial Fisheries Department, Victoria

(7) Banana cooler. Courtesy Canadian General Electric Co., Ltd.

(8) The first commercial pack of frozen peas and frozen strawberries in Canada, 1934. Courtesy Department of Agriculture, Ottawa

(9) From source of supply to warehouses to point of consumer refrigeration units protect food supplies. Courtesy "Birds Eye Frosted Foods"

(10) Frozen chickens. Courtesy Department of Agriculture, Ottawa

(11) Adequate lighting assists inspection. International Commercial Photo

Fish Frozen in Canada, 1935 to 1939

1935	40,934,691	pounds
1936	45,477,674	"
1937	52,526,307	"
1938	59,024,832	"
1939	64,538,662	"

Meat Packing Plants and Abattoirs

The meat packing industry, now one of the largest in Canada, is almost wholly dependent upon refrigeration for its existence.

The earliest record of cattle in Canada is in 1610. By the early 1870's an important cattle industry had grown, and exports of live cattle to the British market had commenced. This reached a total of 108,000 head by the year 1890, when an agitation by British farmers, who claimed that Britain was becoming merely a fattening ground for imported cattle, resulted in the passing of laws requiring that all imported cattle into Great Britain be slaughtered within twenty-four hours of debarkation.

These laws seriously affected the Canadian shipper, as finished cattle in Canada cost more; freight rates were higher; a shrinkage in weight was evident during a transatlantic voyage, after which the cattle were not in prime condition; and as the cattle had to be slaughtered almost at once, this resulted in depressed prices.

To circumvent this situation, companies were organized in Canada to slaughter the cattle here, and export the dressed carcasses. In 1907 a Federal Inspection of Meats and Packing Houses law was introduced, and seven years later all the large packing houses in Canada were busy slaughtering and packing.

This change-over is evident from the exports of beef and pork from Canada, which amounted to only 436,000 pounds in 1910-11 compared with 10,301,000 pounds in 1932-33. During the year 1936, the live stock slaughtered and serviced by refrigeration in Canada totalled 5,916,345 head; with a total value of products at $156,971,640.

Fruit and Vegetables

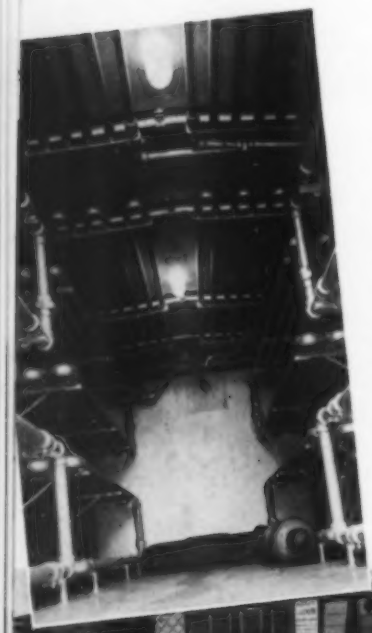
An increasingly important part has been played by refrigeration in the development of the fruit and vegetable industry within recent years. During the year 1938, a total of 10,978,015 pounds of fruit valued at $763,876, and 469,000 pounds of vegetables valued at $64,613, were frozen. Of the fruits frozen, 7,630,420 pounds, valued at $490,842, were preserved in a cold carbon-dioxide gas storage.

Quick-freezing has also come well to the fore since its inception at the Dominion Experimental Farms, in Ottawa, ten years ago. In 1934, W. H. Heeney of Ottawa, working in collaboration with the Experimental Farms, marketed the first quick-frozen Canadian fruit — strawberries. By 1938 this company was marketing about sixteen different varieties of quick-frozen fruits and vegetables in Canada and in other countries. Other companies entered this field about two years ago, the most important of which was the Deerfield Packing Company, a branch of Ceneral Foods Corporation. And very recently the Canada Packers Company installed quick-freezing equipment in their Brantford, Ontario, plant.

Dairy Industry

In modern dairying practice, refrigeration has become almost an absolute necessity. In the case of milk supply to the city, the milk has usually to be chilled as soon as possible to about 40 degrees Fahrenheit, but never below the freezing point; and after pasteurization it has again to be chilled.

Eggs have the tendency to deteriorate rapidly after laying, and this can be



Left:—Inside view of a Quebec Provincial Government refrigerated truck.

Bottom:—Provision for the prevention of spoilage of farm products during transit is ensured by the use of special trucks used for freezing fruits and vegetables collected from farms.

Photos courtesy Armstrong, Cork & Insulation Co., Ltd.

Canada's refrigerator cars play an increasingly important part in conserving and extending markets for perishable products.

Courtesy C.P.R.

Courtesy C.N.R.

Interior of C.P.R. refrigerator, with floor racks raised.

Interior of C.N.R. refrigerator ready for service.

arrested by proper cold storage. But as it is difficult and costly to store eggs in the shell, due to large scale breakages, special handling, crating, and the large space occupied, most of the eggs for commercial products and for institutional uses are shelled and stored in suitable small metal containers.

Baking Industry

Although it would appear paradoxical for a baker to look to refrigeration for help, yet this has played a big part in the efficient and economical growth of the baking industry. It is used in preserving fruits, eggs, milk, butter and whipped cream which are used in pastries. It is also used to retard fermentation in prepared dough, which enables the baker to follow a reasonable schedule of work and be assured that his products will be sound, irrespective of outside weather conditions.

Refrigeration has also been applied successfully in keeping bread fresh over a long period. Frozen at minus 30 degrees Fahrenheit, bread has kept fresh for as long as ten weeks.

Artificial Ice Arenas

One of the more commonly known uses of mechanical refrigeration in Canada is in artificial ice arenas, for hockey, ice-skating and curling. This enables both players and spectators to enjoy the winter sports in comfort. First developed in the West, they gained popularity after 1920, and we now have them in practically every city and large town in the country. One of the best equipped arenas in Canada is in the Northland, the combined skating, hockey and curling arena of the McIntyre Mines at Schumacher, Ontario.

The usual arena, with an ice surface about 90 feet wide by 185 feet long, uses from seven to nine miles of cooling pipe coils in the floor. The ice surface can usually be made and completely thawed out in approximately four hours.

Fur Industry

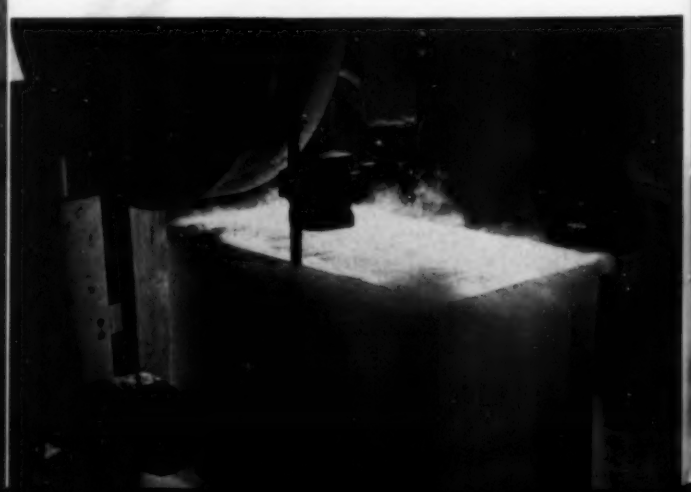
The fur-trading industry has grown rapidly in Canada during the past generation, and we now have over 9,000 fur-farms in the country, producing an average of about $5,780,000 worth of pelts per year. Refrigeration is used for the necessary preservation of the fresh food for the animals.

Soft Drinks

In almost every phase of the soft drink industry the use of refrigeration is evident. These drinks are manufactured by compounding syrup, acids or fruit with car-

Solidified carbon dioxide used as a refrigerant where a liquid residue is objectionable. Known to the trade as Dry ice.

Courtesy Liquid Carbonic Canadian Corp'n. Ltd.



bonated water. Refrigeration is used in the manufacture of the necessary carbon-dioxide gas. One of the more important functions of refrigeration in this aspect is to control the degree of carbonation by temperature, thus assuring a uniform product regardless of the varying water temperatures. It is also essential for cooling bottled drinks in the retail stores, to satisfy the requirements of the trade.

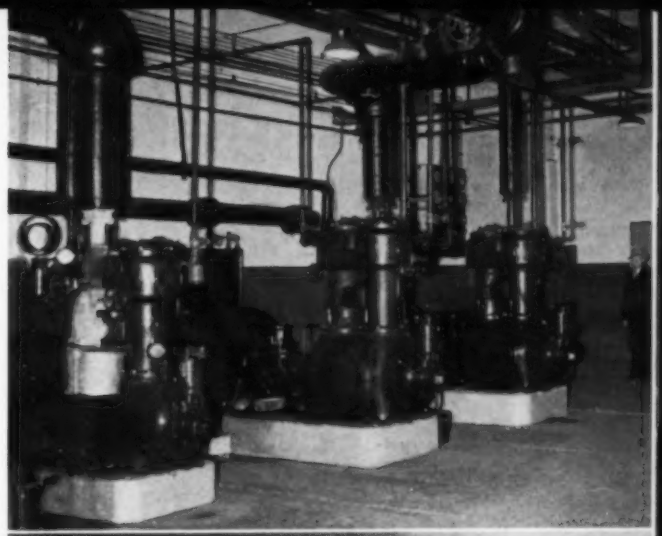
Brewing

One of the essential factors in the production of brewed beverages is to ensure that the colour be the proper shade, and this results from proper storage conditions of the hops, etc. The fermented wort, when evolving into an aromatic carbon dioxide, a suitable flavour and alcohol, requires that the brew be stored for ageing, carbonation, cooling, then filtering. Refrigeration is used for cooling the wort, cooling the cellars and attemperation, and for cooling the beer in the coolers. This usually requires very large refrigeration equipment, and in a large sized brewery requires about ten miles of cooling coils.

Air-conditioning

The principle of air-conditioning, a name coined over thirty years ago, has been adopted to a large extent in Canadian industries. And it is interesting to note in this connection that "Pure-Air Circulation" refrigeration systems were installed in Canada as early as 1896, and are still being installed. This system utilizes the same principles as are now employed in modern air-conditioning.

1



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(1) Electrically driven ammonia compressors in a modern cold storage plant.
Courtesy Provincial Fisheries Dept., Victoria

(2) Ice-making is still one of the prime uses of ammonia refrigeration. Here are freshly frozen ice blocks being placed in storage.
Courtesy York Ice Mach. Corp

(3) Cylinders of ammonia, one of the principal chemicals used in modern refrigeration, awaiting shipment.
Courtesy Canadian Industries Ltd.

(4) Photo of Canada Packers plant, Vancouver, B.C.
Leonard Frank photo

4

Air-conditioning has been used with great success in the storage of foods; processing in cotton, woollen, rayon and silk plants; in the making of capsules and gelatines in pharmaceutical plants; in the making of gun-powder; in curing cheese; in machine-shop tool-rooms; aeroplane factories; paper mills; mines; banana-ripening rooms; printing plants; hospitals; libraries and museums; and in miscellaneous other industries, plants and public places. And as cooling is one of the essentials of air-conditioning, refrigeration plays a very big part in all these enterprises.

Miscellaneous Industries

In the oil industry refrigeration is necessary in order to separate the paraffin wax. In engineering it has been used for the freezing of acquiferous soil when making underground railroad stations, bridges, and large hydro-electric developments; in cooling and thereby shrinking aluminum rivets that they may enter smaller holes, and also prevent breaking the heads, when manufacturing aeroplanes; in the form of "dry ice", which has a temperature around 110 degrees below zero, Fahrenheit, for cooling and shrinking journals and allowing them to be shrunk into tight fitting heads, when necessary; for shrinking liners into internal-combustion engine cylinders; for connecting pins in bridge structures; and for removing broken or worn shrunken-on shafts or journals.

Its diverse uses also include cooling aquarium water to suit certain varieties or species of fish; in optical works for the quick chilling of pitch matrix so that the optical lenses can be quickly detached and thereby prevent breakages; for the cooling and hardening of chocolate casings in confectionery plants; for cooling water and chemicals to suit production in cotton, rayon, silk and photographic plants; and in numerous other industries. The largest refrigeration installation in Canada is at the Shawinigan Chemical Company, Shawinigan Falls, Quebec.

Locker Storage Plants

About five years ago a unique form of small cold storage locker plant was started in the United States, and about two years later the first one was constructed in Canada. This type of plant has grown enormously in popular favour. There are now over 2,500 of these plants in the United States, and over 100 in the Province of Ontario.

The best equipped type of locker plant has a Killing Room, a Chill and Ageing Room where the meat is cooled and ripened, then cut into steaks, chops, etc., and frozen; a Processing Room for the cutting and wrapping of the meat into convenient sized packages; a Quick-Freeze Room; and a Locker Storage Room. In the latter room, the lockers are stacked one on top of another, in tiers, along walls and aisles. The lockers are about fifteen inches high, twenty inches wide, and thirty inches long. The patrons pay a rental of from five to ten dollars per year, plus a small service charge for cutting and wrapping by the butcher who is in charge. Naturally, the great mass of these plants are in farming communities, and in most cases in Canada, are contiguous to a creamery.

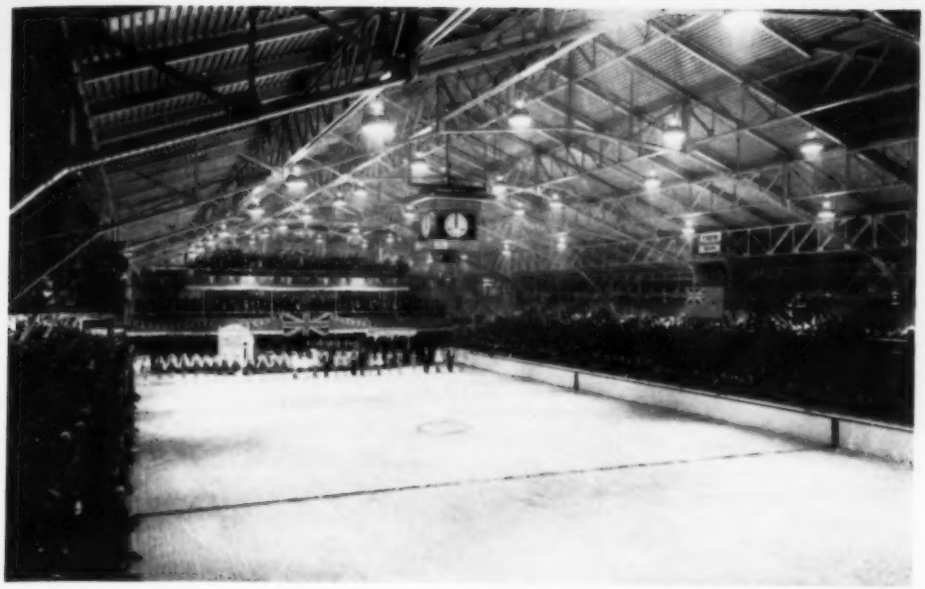
Commercial Refrigeration

The use of commercial refrigeration units has increased enormously during very recent years. There are now about 400 service engineers in Canada installing and servicing such equipment in retail stores, beverage rooms, hospitals, mortuaries, fur storages, bakeries, florists, hotels, department stores, cold storage locker plants, creameries, and many other places. That they have proven of inestimable value to the owners is amply shown by the fact that sales have increased over 200 per cent during the past five years.

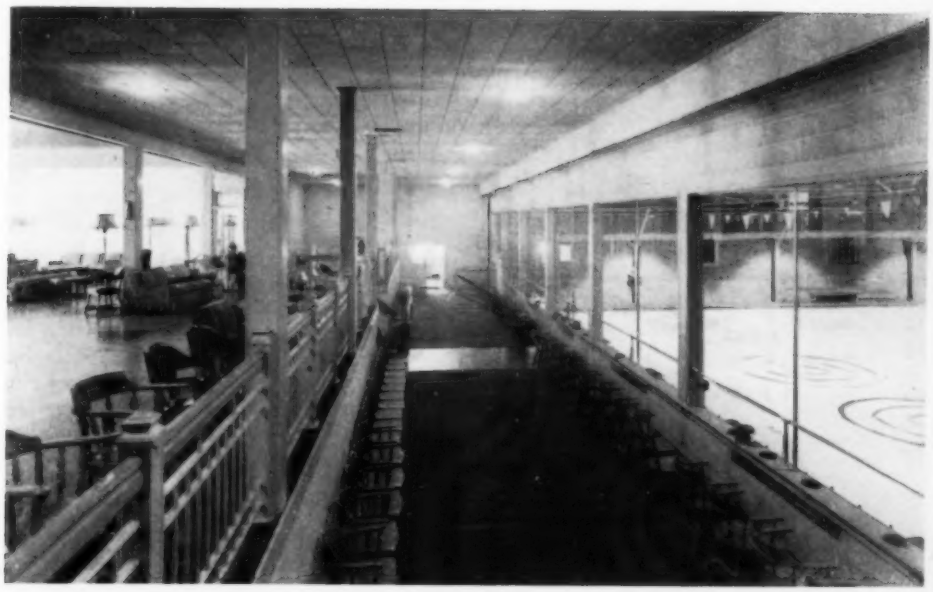
Technical Applications

As a therapeutic agent, refrigeration has accomplished valuable service in the field of medicine and surgery. It is now used in all the leading countries for the storage of human blood for emergency transfusions; a practice that was initiated into Canada over three years ago.

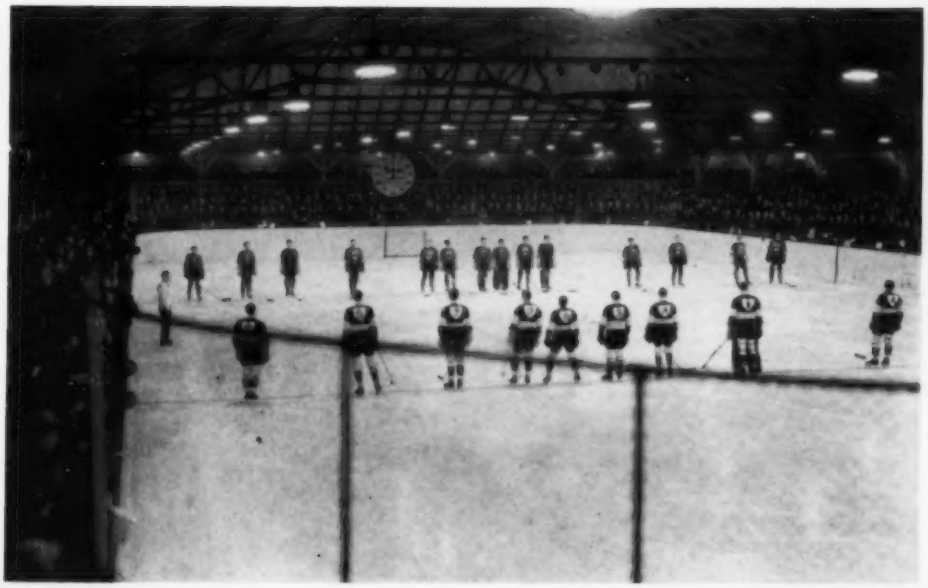
Refrigeration has also been successfully used in the assuaging of cancer pain; while in some cases it has effected marked improvement in the malady. It was used successfully in carrying the human eye of an executed man some 400 miles that it be grafted into the sightless eye-socket of a boy. Small refrigeration sets are also used to some extent in making "ice-packs" for fevered patients, and in cooling hot operating rooms.



Opening night, McIntyre Community Rink, Schumacher, Ont., 1938.



Luxuriously appointed Northern Ontario curling arena.



View showing ice surface at Stanley Stadium, Copper Cliff, Ont., owned by International Nickel Co., Ltd.

Photos courtesy J. H. Lock & Sons, Ltd.

Domestic Refrigerators

Pioneered twenty-six years ago, the domestic refrigerator has come rapidly to the fore. In 1929 Canada produced 4,687 commercial and domestic units, compared with a total of 64,792 domestic units during 1937. These were produced in fourteen plants.

Studies have shown that as much as 20 per cent of the food purchased by the average family who has no refrigerator is spoiled, compared with only 10 per cent for one with an electric refrigerator.

The cost of a modern domestic refrigerator is now less than one-quarter of the 1921 price, and less than one-half the 1928 price. On top of this lowered cost there is an equal increase in efficiency, utility and beauty of design. The ice-freezing rate is three times faster than in the 1927 model, and the electric power consumption only 40 per cent; with the 1940 refrigerator using only as much electric power as a 60-watt lamp.

Economic and Social Advantages

The economic and social advantages of refrigeration are considerable. It has permitted an all-year market for many perishable products, thereby improving our national health and increasing our national wealth through the export market.

Domestic refrigerators are salient factors in household economy of foodstuffs.
Courtesy Canadian Westinghouse Co., Ltd.

Canada exported during 1938 — the latest figures available — the following fresh foods:

Fish	$28,510,056.
Potatoes and Turnips	1,357,000.
Apples	7,776,958.
Lobsters	2,257,760.
Tobacco Leaf	5,191,720.
Bacon and Ham	33,404,206.
Beef	1,207,021.
Pork	2,774,475.
Poultry	715,434.
Fruits (non-canned)	16,546,947.

On top of that total of $99,741,577, Canada exported refrigerating equipment to the value of about $800,000 during the same year.

This has only been possible by continued scientific research, and development in equipment in all phases of refrigeration.

Insulation

As insulation is one of the more important factors in assuring uniform controlled temperatures, this subject is of fundamental interest to all concerned with refrigeration. Poor insulation causes an appreciable loss through heat penetration, resulting in increased refrigeration capacity, and in poor temperature control.

Just after the turn of the century the principal insulants used in Canada were dry sawdust or wood shavings, and, to a lesser extent, fossil meal, silicate cotton, willow charcoal, or wool, rammed down between walls of match-boarding covered with water-proof paper.

About thirty-four years ago cork-board was introduced into Canada as an insulant. This bark of the evergreen oak tree, grown in Spain, Portugal and Morocco, was found to have unique cellular structure. It is claimed that one cubic inch of the natural cork has approximately two to three hundred million minute air cells, each hermetically sealed, which prevent the circulation of air through the material. It is impervious to water and air, and is an excellent non-conductor of heat.

Cork-board has been increasingly utilized in all refrigeration plants as a first-class insulant. To a lesser degree, and under less severe conditions, other insulants are used, such as fibre-board, kapok, rock-wool, aluminum foil, palco-bark, hairfelt, and insulants with asbestos basis.

Transportation

The rail-car was the first modern refrigerated transportation vehicle in Canada.

The first of these cars came into operation just over fifty years ago in North America, and quickly found favour in Canada. They were, however, poorly equipped compared to our modern refrigerated car.

An improvement came with the initiation of end ice-bunkers, with fans blowing the cold air through the ice on to the foods which were stored in the centre body of the car. This was later improved by installing slatted floor boards to enable the cold air to penetrate to all parts of the bulk of the foods, and by improving the insulation.

The design of these cars has now been radically changed to allow for temperature and humidity control, air distribution, and for cooling in summer and heating in winter, to give the required conditions for storage.

The latest development is in overhead ice-bunker cars, which have a capacity for 6,500 pounds of crushed ice in the eight overhead tanks. This ice is usually mixed with a large quantity of salt to produce any required low temperature; a ratio of thirty pounds of salt to a hundred pounds of ice giving a temperature of minus 5 degrees Fahrenheit.

These cars have baffles and flues to divert the cold air and the ice meltage, and metal sub-floors to form troughs for drainage. Hairfelt insulation is used in the floors and roof. And although only introduced in 1939, they have already proved to be, in experimental runs in different parts of Canada and the United States, with a wide variety of foods, one of the most practical improvements for many years. On one recent run from Winnipeg to Montreal, a check showed that there was only one degree variation over the entire trip.

Transportation of frozen and fresh foods by sea was not developed in Canada until very recent years, although a "refrigerated" ship carried a shipment of salmon from Canada to Great Britain in 1886. This isolated experiment was not developed, and for many years the great mass of Canadian fresh and frozen foods for export was shipped from United States ports.

The first change came in 1921, when the *S.S. Canadian Commander* and the *S.S. Canadian Leader* were each installed with 11,332 cubic feet of refrigerated space, and the ships were put to operate between Montreal and British ports.

The prime difference between rail and ship transport is in the mode of refrigeration. In the case of rail-cars, ice and salt are used as the cooling medium; while ships have mechanical refrigerating compressors, with a system somewhat similar to that in cold storages. A refrigerated ship is, in fact, a floating cold storage.

The advent of refrigerated trucks to carry foods from the farms to the freezer, and from the freezer to the cold storage, and for distribution from the cold storages to the retail stores, is one of the more modern developments. These trucks are well insulated with suitable protective materials, to keep out the heat in summer, and the extreme cold in winter. The cooling medium is invariably "dry-ice", which evaporates without leaving any trace of moisture behind. A few trucks have been equipped with a small refrigerating machine.

The latest ultra modern mode of refrigeration transport is by air. In this case, the perishable goods are packed in an air-tight carton, are well insulated, and are cooled by "dry-ice". Each carton is a miniature cooler in itself.

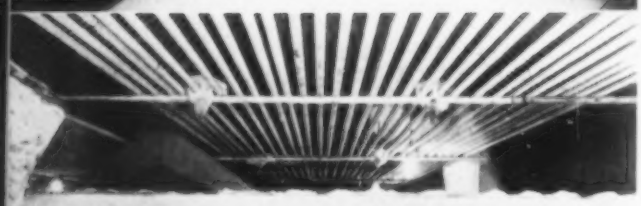
Refrigeration and the War

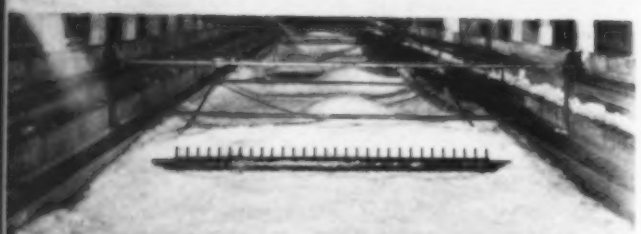
The Great War of 1914-18 offers some basis for studying the effects and value of refrigeration on the present conflict. We have to harvest, preserve and transport food for the entire country, as we are now cut off from many of our former sources of supply, such as New Zealand lamb, South African fruit and Norwegian fish. We have also to feed a huge floating fighting population, and this population may make extraordinary demands on the industry by its increasing greatness in size.

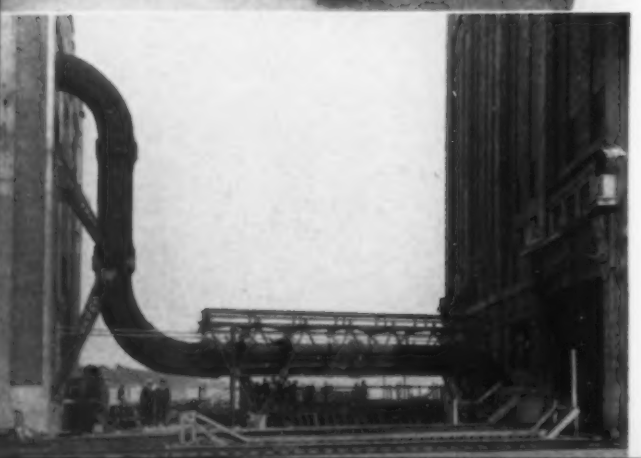
We have also to feed, or help feed, the fighting forces in Great Britain, and the British people. The magnitude of this may be somewhat gauged from the fact that a soldier consumes about one and a quarter pounds of perishable food daily, and this must, of necessity, be highly palatable and nutritious. Such could not be accomplished except by highly efficient and scientific methods.

In 1917 we were exporting 17 million pounds of fish to the British market, and this was greatly increased by 1918. To-day, this total will be much greater. During the years 1910 to 1920, the investment in Canadian packing plants rose from $15,000,000 to $80,000,000, due to the extraordinary demands of the war.

As the satisfactory feeding of a nation is the first line of defence against all forms of attack, the proper processing, storing and rationing of foodstuffs are of prime consideration. After the Great War of 1914-18 General Ludendorf said that the







British blockade of Germany was the deciding factor in forcing that country into peace And the late Hon. J. R. Clynes, in a statement in 1938 said: "In war-time Britain can be half-starved in a couple of months. The Germans and our own people did not know it, but twice I had to put before the War Cabinet figures which showed that bread famine, with inevitable riots and probably results like those which later defeated Germany, was only a few days away."

To offset such calamity during this war, the British Government initiated an efficient food preservation scheme on the outbreak of war. A national food control policy was set up, and all cold storages over 2,000 cubic feet capacity were immediately sequestered. Regional committees were formed, representative of cold storage operators, refrigeration engineers, food specialists, manufacturers and representatives from allied industries. This committee was headed by the newly appointed Minister of Food. And to ensure efficient transportation of foods, special advisory committees were designated by the Minister of Transport. Wholesalers were required to become members of the Wholesale Meat Supply Association, which had eight regional committees scattered over the country. And, to complete the cycle, retail butchers were grouped in Retailers' Buying Committees.

This thoroughness was carried through on a gigantic plane to cover all prospective needs of the people of Great Britain in food supply. And when we remember that there are about 50 million people on the island, with normal food requirements of between four and five pounds per head average per day, this means the adequate supply, storage and distribution of over 200,000,000 pounds of food per day.

In fact, according to a statement, in 1938, by Captain Euan Wallace—who was then British Financial Secretary of the Treasury—in the House of Commons, Great Britain normally imports from $15,000,000 to $20,000,000 worth of food daily; more than half of which is frozen, and during the fiscal year 1937-38, the fighting forces were fed with 39,000,000 pounds of frozen beef and mutton, only 6,900 pounds of which originated in Great Britain. With

(1) Refrigerating machinery in an artificial ice plant at Schumacher. Skating, hockey and curling are provided for in this Northern Ontario rink of the McIntyre Porcupine Mines, Ltd.
Courtesy J. H. Lock & Sons, Ltd.

(2) Sheffield Farms, New York City, Flake ice pouring down from the flake ice machines on the next floor into the storage bins.
Courtesy York Ice Mach. Corp.

(3) View of cold storage facilities at Montreal Harbour.
Courtesy Armstrong Cork & Insulation Co., Ltd.

(4) Harbour cold storage, Montreal, has 3,000,000 cubic feet of refrigeration space and is the largest cold storage in Canada. Note the piping heavily insulated with cork-board.
Courtesy Armstrong Cork & Insulation Co., Ltd.

her present augmented population, and the cutting-off of supplies from many other lands, Canada is in the unique position of being a storehouse for Great Britain as well as for herself.

On top of the food demand, refrigeration has a most important place in many of our war industries.

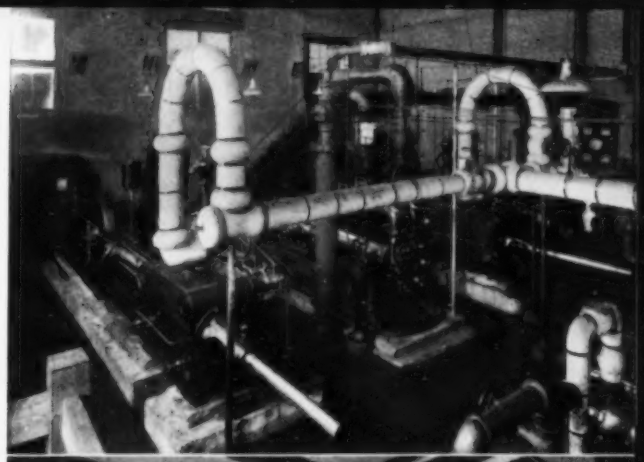
Conclusion

The uses of refrigeration have encroached into almost every phase of our industrial, commercial, social and domestic life. It has reached a stage of increasing acceptance. Many and varied have been the innovations during recent years; such as artificial snow for packing purposes; hermetically-sealed refrigerating units; new refrigerants such as "Freon"; "dry-ice"; gas-storage; cold storage locker plants; bactericidal agents; suitable packaging materials and "quick-freeze".

But much has yet to be accomplished. We have yet to produce a perfect wrapper that will completely prevent dehydration and oxidation; our gas-storage studies are still in the early stages; bactericidal agents are yet not always economical to adopt; our locker plants can stand a great improvement in design and acceptance; and "quick-freeze" has yet to be "sold" to the Canadian public, despite the fact that it is proven beyond all doubt as to its acceptability.

With increased demand for quick-freeze will come larger production, resulting in lowering of prices. Our farms and fisheries are yet far from the efficiency that guarantees the best possible products to the cold storages, and hence to the public. In meat packing, this industry was forced by the exigencies of the fall in market in 1929-30 to work for intense efficiency in all aspects.

The present time also offers a unique opportunity for Canada to so increase in her efficiency in food production that she will not only develop to fully satisfy the present extraordinary demands made on her, but she will keep these markets that have hitherto been largely held by other countries. And in this work, that will have a most beneficial effect on our farmers, fisheries, and other industries, refrigeration will play a stellar role.



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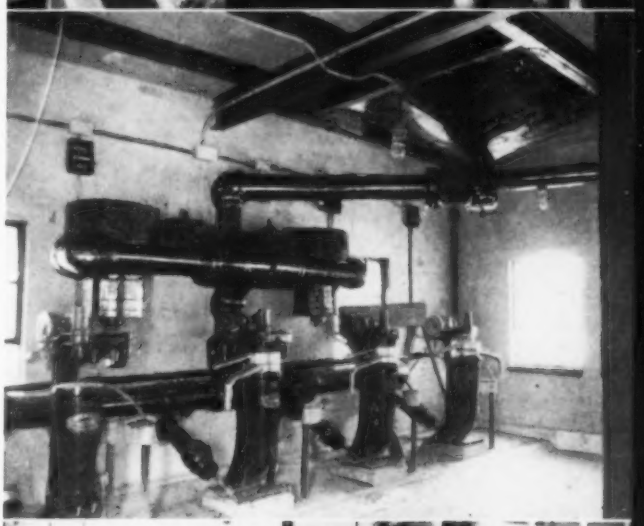

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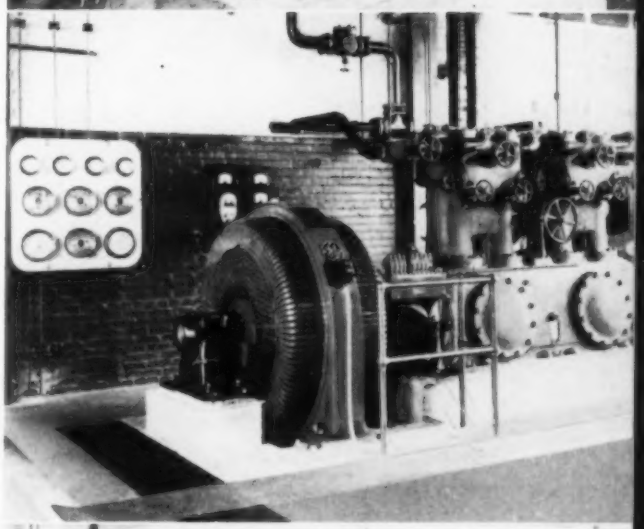

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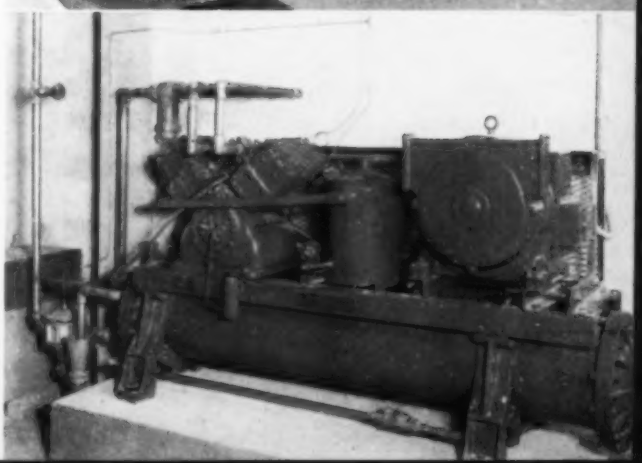

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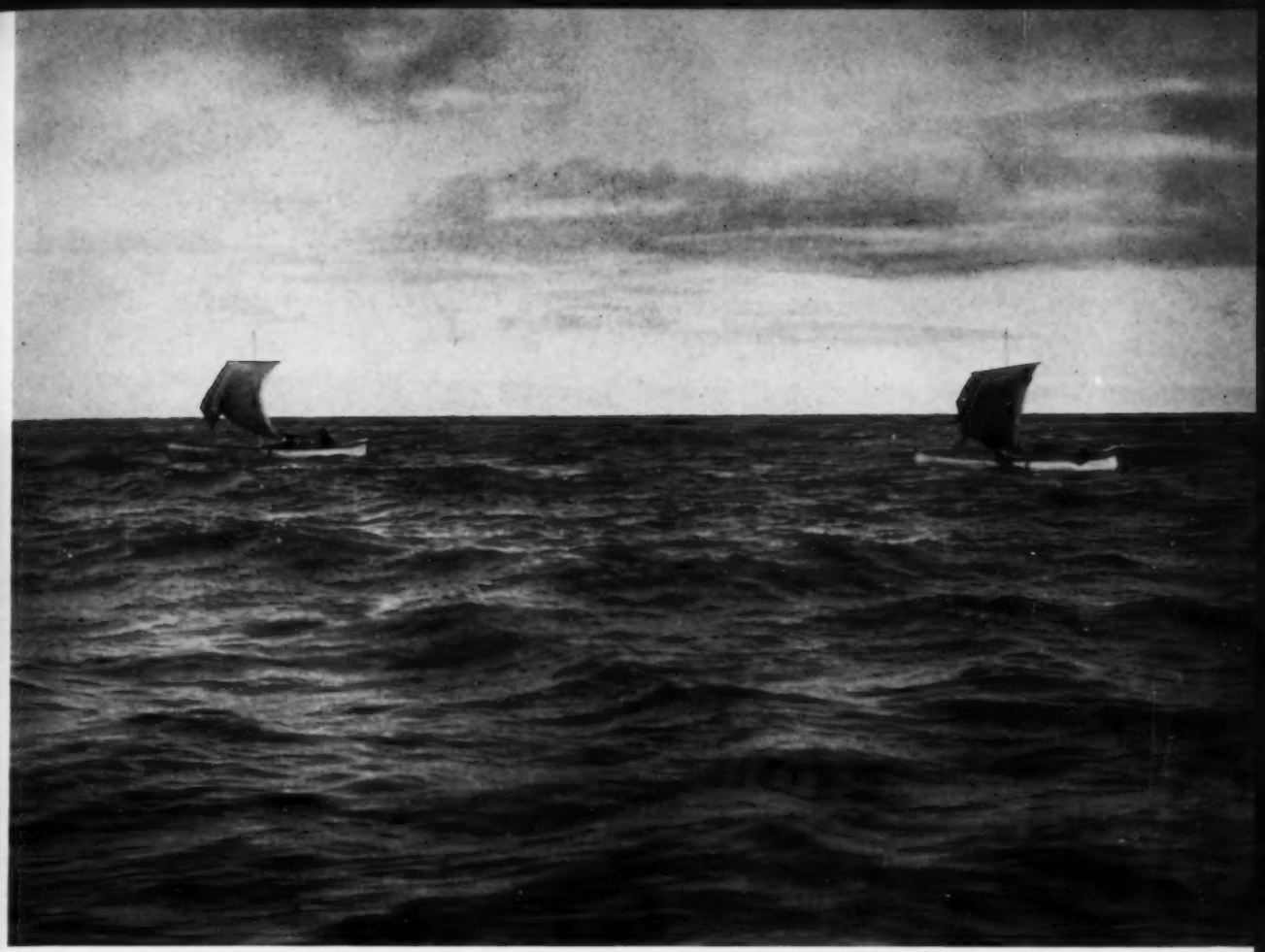
(5) Engine room, Harris Abattoir Co., Ltd., Toronto, Ont. The refrigerating machinery was installed about 1896.
Courtesy Linde Can. Refrigerating Co., Ltd.

(6) Sharpless system cold settling plant for paraffin lubricating oils, Imperial Oil Refineries, Ltd., Sarnia, Ont. Piping is covered with special brine thickness nonpareil cork covering; tanks with three layers of 2-inch corkboard.
Courtesy Armstrong Cork & Insulation Co., Ltd.

(7) Modern refrigerating machine in an industrial plant.
Courtesy Canadian Ice Machine Co.

(8) Commercial compressor used for making ice and preserving foods at the R.C.A.F. Training Centre, St. Thomas, Ont.
Courtesy Kelvinator of Canada, Ltd.

Courtesy Armstrong Cork & Insulation Co., Ltd.



A piece of tobacco tossed into the water is a supplication for "Namiwan" (fair wind). The square-rigged sails are frequently used by the natives in canoes.

COMPLETING THE WORLD'S LONGEST SURVEYED STRAIGHT LINE

by **B. W. WAUGH**

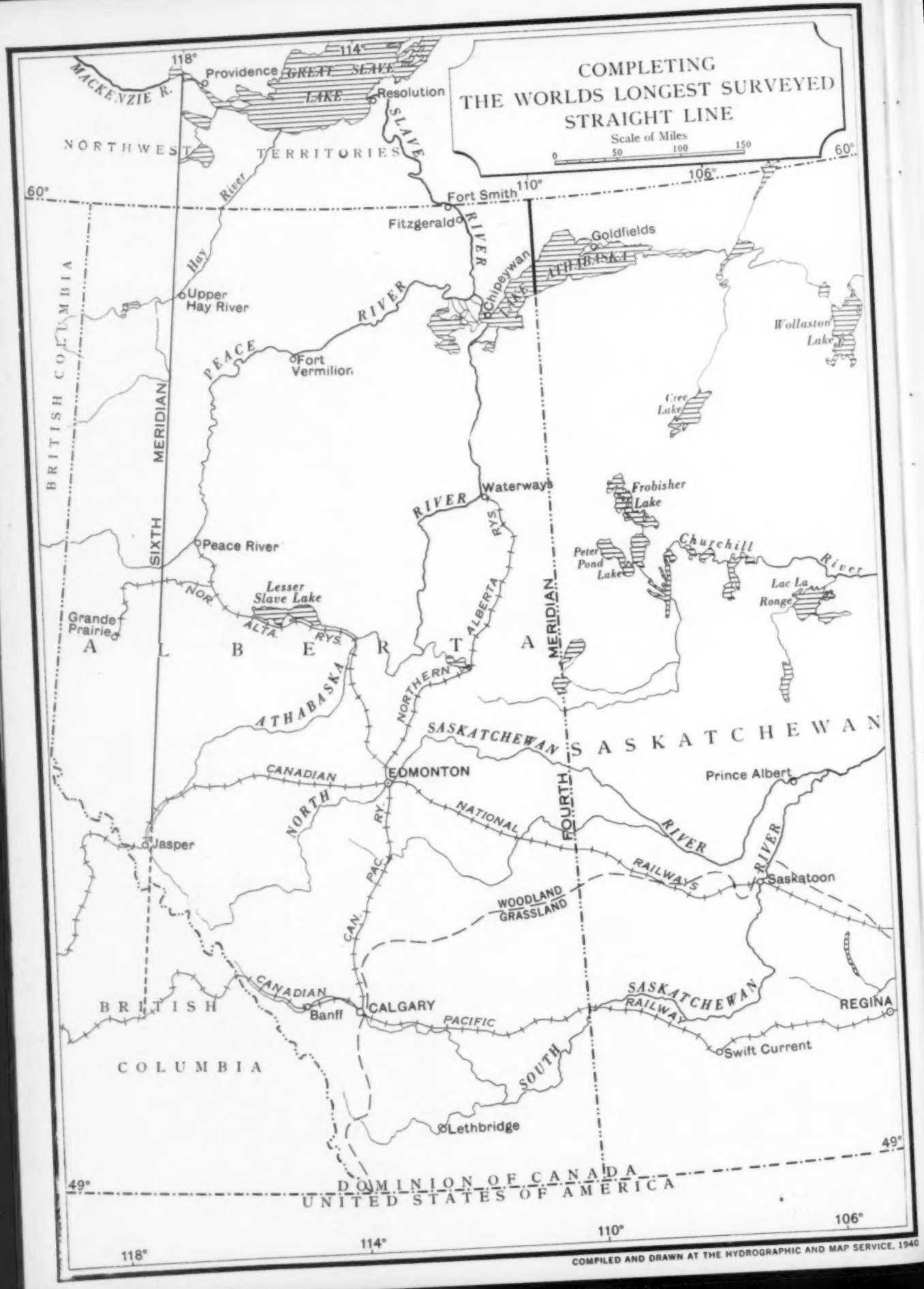
Foreword by F. H. PETERS*

BY the Saskatchewan and Alberta Acts of 1905, the Provinces of Saskatchewan and Alberta were created and the Fourth Initial Meridian of the Dominion Lands Survey System was designated as the boundary between them.

Those who are familiar with the system of survey of Dominion Lands know that the initial meridians form the upright members of the structure that governs the subdivision into townships and sections. The system was inaugurated by Lt.-Col. J. S. Dennis, the first Surveyor General of Dominion Lands, and the first monument in the system was erected on the First Initial or Principal Meridian, near Winnipeg in 1871. Seven years later Col. Dennis's son, the late J. S. Dennis, Jr., Dominion Topographical Surveyor, located the Fourth Initial Meridian in approximate longitude 110° west of Greenwich. In succeeding years such prominent surveyors as William Ogilvie, Montague Aldous, J. N. Wallace, and J. B. McFarlane surveyed portions of the Meridian until, in 1912, it had been completely surveyed from the International Boundary to the south shore of Lake Athabaska. The great difficulties of producing and measuring a line across so large a body of water made it seem inadvisable to

Top left:—A small canoe is carried along the survey line for ferrying across the numerous lakes.
Left:—Plane fitted with pontoons for summer flying. It is drawn up to shore ready for loading the camp equipment.

* Surveyor General of Dominion Lands



COMPILED AND DRAWN AT THE HYDROGRAPHIC AND MAP SERVICE, 1940

produce it farther at that time. Recently the active development of the mining and fur industries in the North made it appear necessary for purposes of administration to establish the boundary between the two provinces on the ground.

Early in 1938 the Saskatchewan — Alberta Boundary Commission was created for the purpose of completing the survey of the boundary line to its northern extremity. M. B. Weekes, Controller of Surveys for Saskatchewan, and A.P.C. Belyea, Director of Surveys for Alberta, with myself as Chairman, composed the Commission. On account of his experience and reputation in Base Line and Meridian surveys, Mr. B. W. Waugh was selected and placed in charge of the field survey operations. Because of his ability, energy, and perhaps partly to what he describes as "his luck", the survey was completed in record time, at low cost and with an exceptionally good closing at the terminal point on the 60th parallel of north latitude. The field work was completed early in September, 1938, and the boundary as surveyed has been confirmed as the true boundary by acts of both the Alberta and Saskatchewan Legislatures.

The boundary line is the first of the western provincial boundary lines to be surveyed to its northern extremity. It is, we believe, the longest completely surveyed and monumented straight line in the world. It extends 761 miles from the International Boundary at 49° north latitude to its terminal point at 60° north latitude or, in other words, from township one to township 127. The Sixth Initial Meridian has been surveyed to the north-east corner of township 143, about 100 miles farther north and well into the Northwest Territories, but the survey of this line has never been extended south of township 48.

Mr. Waugh, in the following article, tells the story of the field survey of the northerly seventy-two miles of the line and contrasts it with a former survey. The main difference between them is the kind of transportation used. Transportation has always presented one of the most difficult problems in making surveys at any great distance beyond settlement. In the earlier surveys on the prairie, Red River carts were used; these were later replaced by waggons and democrats. As the surveys reach into the wooded areas, pack-horses may be substituted where horse feed is available; in other areas, canoe transport supplemented with varying amounts of man-packing is used in summer, and dogs with toboggans in winter. Since its advent, the automobile is used to advantage on certain types of survey, and now even the aeroplane is playing its part. Thus the surveyor keeps in step with progress and employs the new tools provided by science wherever they are economically applicable to his work.

Many stories, such as Mr. Waugh's, relating to the original surveys across Canada, could be told, which would form an epic theme in the history of the earliest efforts made to open up for settlement and development the vast natural resources possessed by the people of Canada. It would be a definite gain if the history of the land survey of the Dominion could be compiled while the survey reports available may still be supplemented with interesting details drawn from the memories of the older living surveyors.

* * *

We were at McMurray in March 1938. Already things had begun to stir in preparation for the spring break-up. Captain Alexander was there to make the stern-

A ten-foot skyline makes it easier to keep a survey line straight in wooded areas.

This monument marks the north end of the boundary line. Monuments are spaced at intervals of from one-half to two miles and from each monument at least one other may be seen.

wheeler *Athabaska* ready for the rush of freight held up by extremely low water the previous fall. We were talking "old times" in the lobby of the hotel, and he had just finished his story about the fall of 1922 when, with the power-boat *Canadusa*, he pushed two barges up-river from Fitzgerald with 104 passengers, mostly survey parties, rushing to get out of the north country before the freeze-up. Then I recognized him because I had been in charge of one of those parties: we had just completed the survey of the Sixth Initial Meridian of the Dominion Lands System of Surveys from the north boundary of Alberta to the Mackenzie River, a distance of 100 miles. It had been a difficult job—in many ways one of the most difficult that I had ever undertaken.

We had gone in through the Town of Peace River, followed the ice down-stream in two barges — one loaded with pack-horses — to Fort Vermilion, travelled by waggon and pack-horse to Upper Hay River, and then proceeded by pack-horse only to our starting point at the 60th parallel of north latitude. Feed for the horses was scarce and the trail none too good. Over the last twenty miles there was neither feed nor trail, so that by the time we reached our immediate destination, the horses were completely played out. We tied them to trees, gave them the last few handfuls of oats, and, early next morning, started them back to Fort Vermilion. Meanwhile our own commissariat was low, and we spent a very anxious time until we found our first supply cache six miles to the north. From here on we man-packed. Our crew was green to the work, and I can still hear the unnecessary clatter of pots and pans as we essayed our first camp move. Moving camp every second or third day, the cook cursing for lack of opportunity to bake bread, necks stiff from the unaccustomed tump-line, mosquitoes, black flies and bull-dogs in swarms, searching for supply caches some place in the wilderness with the ever present fear of non-success, rancid bacon, tobacco shortages — these were some of the trials and tribulations of that survey in 1922. We were actually on survey work three and one-half months. It had taken us twenty-five days to reach the work and another nineteen days to return to civilization, or

The Saskatchewan-Alberta Boundary Line is well marked on the ground by posts cemented into bedrock and referenced by stone mounds.

a total of one and one-half months of travelling.

Sixteen years later, and incidentally sixteen years older, we were here again going north on another survey, McMurray and Waterways having changed in the interval. Then the only hotel or stopping-place was at Waterways — a frame building which burned down while we were there waiting for a train to take us south. Now there was a hotel at each place, many new houses, a salt manufacturing plant, stacks of mining machinery awaiting transport to the new gold mines of the north, planes arriving and departing, and even a taxicab service.

This time the survey to be made was the boundary line between the Provinces of Saskatchewan and Alberta. In 1912 it had been surveyed to the south shore of Lake Athabaska; proper administration now required that the survey be extended farther north. Our job was to continue it to its terminal point in latitude 60 degrees north where it meets the south boundary of the Northwest Territories.

The first objective was to carry the line over the twenty-five miles of Lake Athabaska to the north shore, and that is why we were here in March so that this could be done on good solid ice still frozen to the shore and not subject to movement, and at a time when the weather was not expected to be severe. We had left Edmonton on Tuesday morning, March 15, and by Thursday morning, had secured our outfit from the railway company and reduced it to the lowest possible weight in preparation for our trip by air to the starting point, about one hundred and eighty miles away. Ordinarily a ten-day trip by dogs or horses, we flew it in an hour and a half arriving at 12.30 p.m. Lunch was eaten on the way and we were ready to start work when we arrived. Not without a heart throb, however, for just at the moment of arrival the landscape was nearly blotted out by a snow squall, and the pilot hurried down while he could still see the landing area he had previously marked out with spruce boughs.

Before the pilot took off on his way back, the cook reported that we had forgotten the salt. "O.K." said the pilot, "How much do you want? I'll have it here by 3.30." Imagine tripping to the

Lunch on the ice of Lake Athabaska is never very enjoyable.

Above:—A single horse with a toboggan carried the pickets and other apparatus necessary in the survey of the boundary.

Left:—The transit man gives the picket man the "O.K." signal on the survey of the Saskatchewan-Alberta Boundary across the ice on Lake Athabaska.

Ski-fitted planes on the ice aerodrome at McMurray. The plane with the nose tent was the one used in transporting the survey party to and from Lake Athabaska during the winter work.

Two camps on the ice of Lake Athabaska were necessary during the survey.

An aerodrome or landing area is marked out where the snow-covering on the ice is smooth.

grocery store over one hundred and eighty miles of bush country to get some salt for supper! However, he was not back until 5.30. One of the peculiarities of the airmen in this country is that they are likely to be overly optimistic about their times of arrival, but one just has to become accustomed to it because they save so enormously in time over ground and water methods of travel. The big observing transit was on the second load; it was immediately lined in, and three-quarters of a pole star observation taken before darkness interfered.

What a difference from the survey of 1922! In that year we were twenty-five days reaching our work from the railway. This time we left the railway at noon, did some survey work, and had supper in our own camp that evening.

Of course it was not all as simple as this. Technical assistant J. W. Doze had flown from Edmonton to Chipewyan the previous Friday, had hired a team of horses with bobsleighs and a single horse with a flat sleigh or toboggan, had purchased the supplies for the job, and had freighted them sixty miles along the lake to our first camp. This was a much less expensive operation than freighting them from McMurray by aeroplane. Besides we needed the horses for our camp transport.

Doze, with the two teamsters and the picketman, had been here for two days when we arrived. They had made camp, and located and cleared out the old line for a distance of one mile south of the lake, so that everything was ready to start the new survey next morning. We first remeasured the old line to make sure that the survey posts we had found were in their correct places, and in the afternoon started out on our voyage over the ice, going slowly in order to arrange the details of survey procedure to the best advantage for accuracy and speed. A pole star observation taken in the evening showed us to be heading too far east by twenty-five seconds of arc or at the rate of seven and a half inches per mile — too great an error to be tolerated on a boundary survey. Next day we straightened this out, rechecked our new work, and established a point on the boundary line five miles out from shore.

The walk home that night was an arduous one. Our easy trip out from town had not hardened us for survey work and the three or four inches of fresh soft snow over a crust that did not always bear our weight made walking difficult. Then, close to shore, there was a large patch of overflow around which we had to manœuvre. It could not be noticed on the surface, and our first intimation of it came when we broke through the top crust into the six or eight inches of slush beneath. It took us two hours to reach camp but the pleasant odours from the cook tent soon drove thoughts of fatigue from our minds.

Even the automobile presents difficulties in transporting the survey camp.

Sunday seemed to provide a good opportunity to send a cache ahead with the team to make sure that only one trip would be required when we moved camp on Monday. Plenty of spruce boughs would be needed for our beds while on the ice, and so we added these to the load we made up and sent them with the teamster to be placed nine or ten miles out on the ice. Then it started to snow, not very hard, but with the continuous wind on the lake, it cut down visibility to about one-quarter of a mile so that it was too dangerous for the teamster to venture beyond the line of pickets we had placed during Saturday's work.

Next day was the most critical of the survey. It was the 21st of March — the time we might expect equinoctial gales, and we had heard stories of the severity of the storms on Lake Athabaska. To be caught on the ice by a bad storm while moving camp might prove disastrous. In the early morning a light snow was falling from a lightly clouded sky and later, when the sun rose, there was a ring around it Did this mean a storm ? The barometer we carried for the purpose said not, so after an hour's wait for the weather to make up its mind, we decided to believe the barometer. We packed up camp and commenced our move away from the kindly protection of the trees out into the great expanse of white, with no land visible in the direction in which we were going. Our luck held, and we had a beautiful day. The tents were pitched nine miles out from shore by using iron survey posts as tent pegs and eight-inch spikes to peg down the walls. The line was surveyed up to camp in time for supper, and we even got a sight on polaris to verify our direction. The night was not extremely cold; we had plenty of brush for our beds and wood for our stoves, so that we were quite comfortable until the cook yelled "roll out" at 6 a.m. next morning.

Tuesday we moved camp another eight miles. Going ahead with the team it was surprising how quickly the linemen passed from view. There was a little fog and a fine drift of snow carried by a strong north-east wind that reduced visibility so much that, by the time we had gone two miles, we had to use the compass to keep direction. Tuesday night was colder, the temperature dropping to zero or lower, and the wind continuing to blow from the north-east. We had only a windbreak to shelter the

Top:—Man-packing on the Sixth Initial Meridian. The cook stove weighed about 100 pounds.

Right:—Man-packing is one of the most arduous forms of transport on survey. Tump-lines are favoured where there are not too many steep hills.

Where grass is available for feed, pack-horses may be used. Swamps in the lowlands present one of the chief obstacles.

Lunch on Buffalo Prairie, north-west of Fort Vermilion. Survey of Sixth Meridian, 1922.

Pack-horses swimming the Hay River in northern Alberta. Survey of Sixth Meridian, 1922.

horses so they probably suffered more than we did.

The following day we moved to the north shore and the line reached camp at 7.30 that evening. Here the loose snow on top of the crust was deeper, making it more difficult for both men and horses. On shore it was three feet deep, and so, after clearing off the ground for the cook tent, we contented ourselves with merely tramping it down with snowshoes for the sleeping tents. Our two nights on the ice had toughened us. In the morning orders had been to discard stove blocks, tent poles, spruce boughs, extra wood, etc. anything that could be replaced at the new camp on shore. However, when we came to pitch the cook tent the stove blocks appeared from under a bed roll, the table stakes from under some hay, and the cook stove was heavier by one oven full of nice dry kindling. Our cook was an old timer; he had worked for nearly every surveyor in Alberta and knew all the tricks.

We finished this part of our survey one week after leaving McMurray. The boundary, as surveyed across the lake, is due north within a very small tolerance, and the distance is measured to a fair degree of accuracy, the difference between our two separate measurements amounting only to one link or eight inches in the twenty-four miles. Of course we had luck with weather, and ice conditions might have been more difficult. To the west of our line a pressure ridge extended clear across the lake, and freighters to Goldfields had to make a bridge across it for their tractors. Had we encountered one of these it would have caused considerable delay, and delay on the ice was something to be avoided. The main thing that made our speed possible was the quick transportation by plane. On our return trip the plane called for us at 5.30 p.m. We packed up, loaded, and got away at 5.50, landed at Chipewyan, sixty miles to the west, to store our cook outfit, and still reached McMurray that evening about five minutes ahead of darkness.

It had been an interesting job, slightly different from the usual run and, of course, we learned some new tricks. We found out how to drive carpet tacks into the ice to mark transit stations; how to use a tarpaulin as a windbreak for lunch instead of building a wall of snow blocks, and that it pays to carry a piece of tin on which to build the lunch fire rather than place it directly on the snow or ice.

We also found out that pilots are particular about the landing areas for their ski-fitted planes. Rough, hard-crusted snow makes the landing of a plane hazardous. The pilot prefers to have it smoothed out by a covering of loose snow such as you occasionally find in lee spots close to shore.

The ice on the lake was from three to three and one-half feet thick making it quite a task to cut a water-hole with the axe and the ice chisel. One of the old timers in the country described to us how he used to do it when he was "on the trail". He would first chop a hole in the top part of the ice sufficiently large to hold his pail; then with his rifle he would shoot vertically down at the bottom of the hole, one or two shots being sufficient to bring water. We were unable to try the method because we had no rifle, but if it works, it would certainly save a lot of labour.

The following July we returned to complete the work, riding down the Athabaska River aboard a flat-topped scow loaded with barrels of gasoline marked "Aviation" and being pushed along by the Diesel-powered tug-boat *Golden Nugget*. It was an enjoyable free and easy trip with no passengers but ourselves. Each day's travel was from 3 a.m. to 11 p.m. Over the short period of darkness we were tied up to shore, and made what provision we could against the mosquitoes that came aboard. Incidentally these four hours constituted the only period of rest for the tug captain. The remaining time he spent in the wheel-house, ten feet above the tug's deck, his eyes intent on the water ahead, picking out the channel he must follow to keep from being grounded. The water was low, and under such conditions, it is the work of an expert to "read the water" and pick out the tortuous channel that will avoid the shoals hidden beneath the muddy surface. Usually the river has a high water period when the water from the mountain snows arrives in the latter part of June or early July, but in recent years the water has been so continuously low that river traffic has been uncertain.

We arrived at Chipewyan on the west end of Lake Athabaska at eight o'clock one evening and left again at one o'clock in the morning, completing the sixty-mile run along the unprotected north shore to our first summer camp by eleven o'clock on a beautiful sunny summer morning. Perhaps the nice day had something to do with it, but of all the survey camps I have been in,

this rated number one. The tents were pitched amongst jackpine trees on a park-like bank with no underbrush; a smooth sandy beach sloped down to the water's edge ten feet below, and the blue water of Lake Athabaska stretched out to the horizon. The swarms of mosquitoes that usually hinder the appreciation of the beauty spots of the North were absent, and they bothered us little all summer, due possibly to the fact that the muskegs were dried up to such an extent that they did not hatch.

The survey differed very little from the many meridian and base line surveys made throughout the western provinces. One difference, though, was the size of our party. We had only twelve men instead of the usual eighteen or twenty-one. With the many lakes available for landing we were able to move our camp from place to place by aeroplane. Consequently, we had no need for the half-dozen men usually employed in man-packing through country of this nature where no hay meadows exist to provide feed for pack-horses, and where there are no suitable streams for the use of canoes.

It was quite a new experience having an aeroplane to move camp. On moving mornings we merely rolled up our beds and tents and went to work on line as usual. At quitting time, instead of walking back to the old camp, we walked ahead to the new one, knowing perfectly well where it would be because we had it marked on the excellent map that had previously been prepared from aeroplane photographs. Then as the plane came in each time to make the move, it brought fresh supplies, mail, and newspapers so that it was almost like making a survey in settled country. Of course the aeroplane could not be used in this manner in many parts of Canada. It was just our good luck that the boundary passed through an area where it could be used economically.

We had forty-eight miles of line to survey; most of it was through rough, rocky country. Forest fires had swept over large areas at different times and left windfalls strewn across our path, making walking difficult. At other places rabbits had chewed off the small jackpine at a height of about two feet. The sharp twigs on the windfalls and the short rabbit stumps were just right for tearing trouser-legs but by using "ambroid" — a glue for patching canoes — we were able to make repairs without the use of needle and thread.

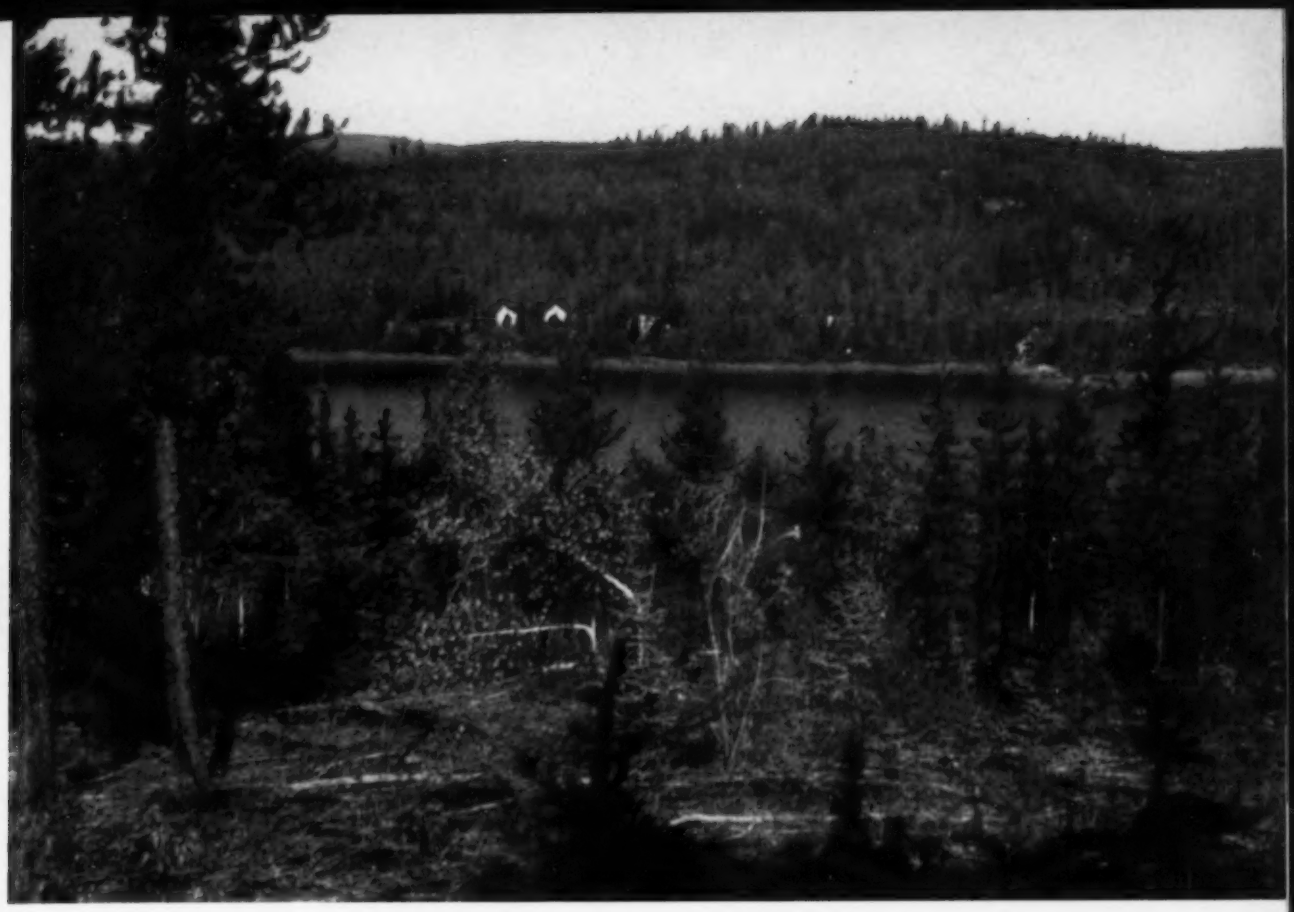
There was very little game in the country immediately adjacent to our survey line. Beaver must have been plentiful at one time for we saw some enormous old beaver dams. From fresh signs of their work they are evidently on the increase again. A cub bear playfully removed some empty lunch haversacks from our small canoe one day, but we disturbed him at his frolic and chased him down the lake-shore. Towards the north part, however, there are deep trails in the mossy valleys made by the Barren Lands' caribou when they come south in the late fall and early winter. We saw only three of them as it was too early in the season for them to come in numbers.

No major interruption occurred in the work, and on the fifth of September we built our last monument, exactly on the 60th parallel of latitude as determined by a precise astronomical observation. The measurement of the boundary line by our steel tapes over the total distance of seventy-two miles agreed with the distance determined by astronomical observations within sixteen links or about eleven feet, a very close agreement which must be attributed partly to good luck. The maximum deviation from true north at any place along the line is probably less than five seconds of arc.

And so, sixty years after it was established as the Fourth Initial Meridian in the Dominion Lands Survey Systems, the boundary between Saskatchewan and Alberta is completely surveyed. Extending 761 miles from the International Boundary at the 49th parallel of latitude to its northern extremity at the 60th parallel, it is the longest surveyed and monumented straight line in the world.

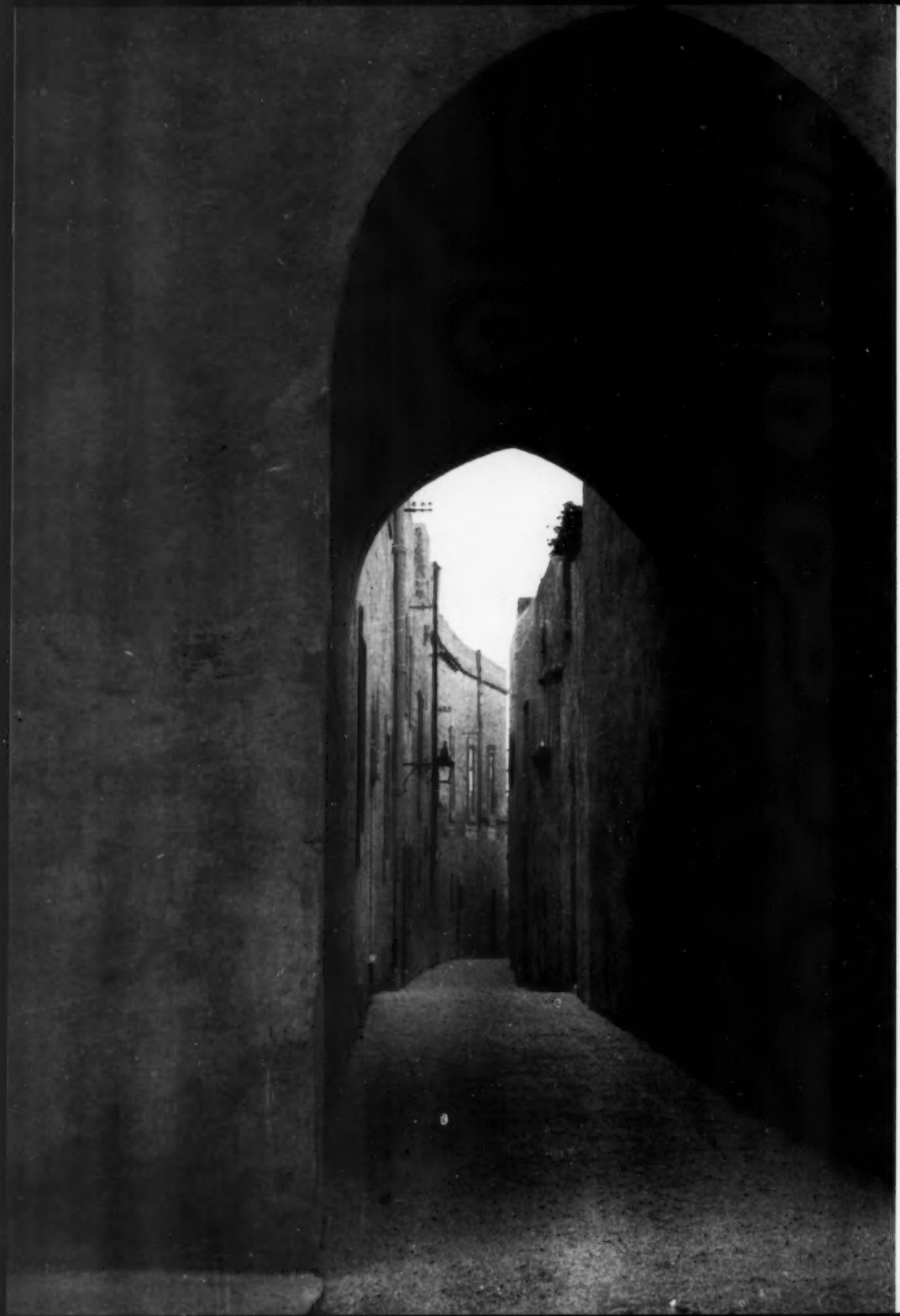
The following morning, September 6, two planes arrived at camp and bore us swiftly south over the 470 miles to Edmonton.

I suppose it is easier and quicker to do surveys this new way, but we used to get a thrill out of successfully completing a hard job the other way, when you had to break into new country all on your own and when, should you be so unfortunate as to forget the salt, you just had to do without it; when the party was dependent entirely on either dogs, horses, canoes or man-packing for transport and there was no aeroplane to come to do it for you. Then you took a good deal of the credit to yourself; this new way, you feel that you have to give a good share of it to the aeroplane pilots. But after all they deserve it — they are doing a good job under difficult conditions.



A typical view of the lake-studded rocky country over which the line passed.

The power-boat *Canadusa* pushing two scows up the Athabaska. The willows in the front scow were bent into a bow and canvas stretched over the top provided shelter.



The Hajar Kim, meaning "standing stones"—a fortress or sanctuary situated on high land overlooking the south coast.

MALTA*

by **JEAN PRATT**

**Editor's Note:—Prepared before the advent of Italy into the present conflict, this article provides a realistic picture of this strategic Mediterranean Isle of the British Commonwealth.*

NOWHERE could be found a land in greater contrast to Canada's wide and verdant spaces than the Island of Malta which lies between Sicily and Tripoli in the Mediterranean Sea. Malta is small, arid and very old. It is about seventeen miles long and about nine miles wide with its long axis running north-west. Hills rise perpendicularly from the sea on the south-west reaching a height of 800 feet inland, and slope gently to the north-east into a curved and deeply indented coast-line. There are no lakes or rivers on the island and trees are a treasured rarity. Its history goes back to the beginning of the world.

To-day Malta is known chiefly as the British Navy's base in Southern Europe. The principal towns, built of the island's natural, butter-coloured stone, weathered to shades of bone and ivory, are crowded about the harbours on the north-east coast; a profusion of roofs and spires rising above vast, pepper-coloured walls that sheer to the water where battleships are anchored among the smaller craft of cargo boats and bobbing *dghaisas*. The capital, Valletta, is built on a long tongue of land between two harbours. Its narrow main roads run in straight horizontal lines, cut at right angles by steep, stepped side-streets in deep shadow.

At midday Valletta is crowded with people and traffic. British civilians, sombrely clad Maltese citizens, uniformed members of His Britannic Majesty's Forces, black skirted priests, Maltese peasant women wearing the black *faldetta* — a curious, stiff hood which surrounds and nearly conceals the wearer's face, and bright-eyed, bare-footed Maltese children stream up and down the streets. Church bells seem to ring continuously. Flocks of pigeons wheel and chatter in the piazzas, and mingled with the warning hoots of the motor traffic is the sharp ting-a-ling of *carrozzi* — the Maltese horse-drawn cab which may be hired for six pence a mile or at three pence for fifteen minutes.

In the shopping quarter, windows full of Eastern silks, lacquer, bronze and ivory curios, Maltese gold and silver filigree,

Left:— A street in Notabile, seen through a Norman arch. Photos by M. E. Nockolds

View of Grand Harbour entrance from Valletta's north-east bastions. Photo by Geo. Furst

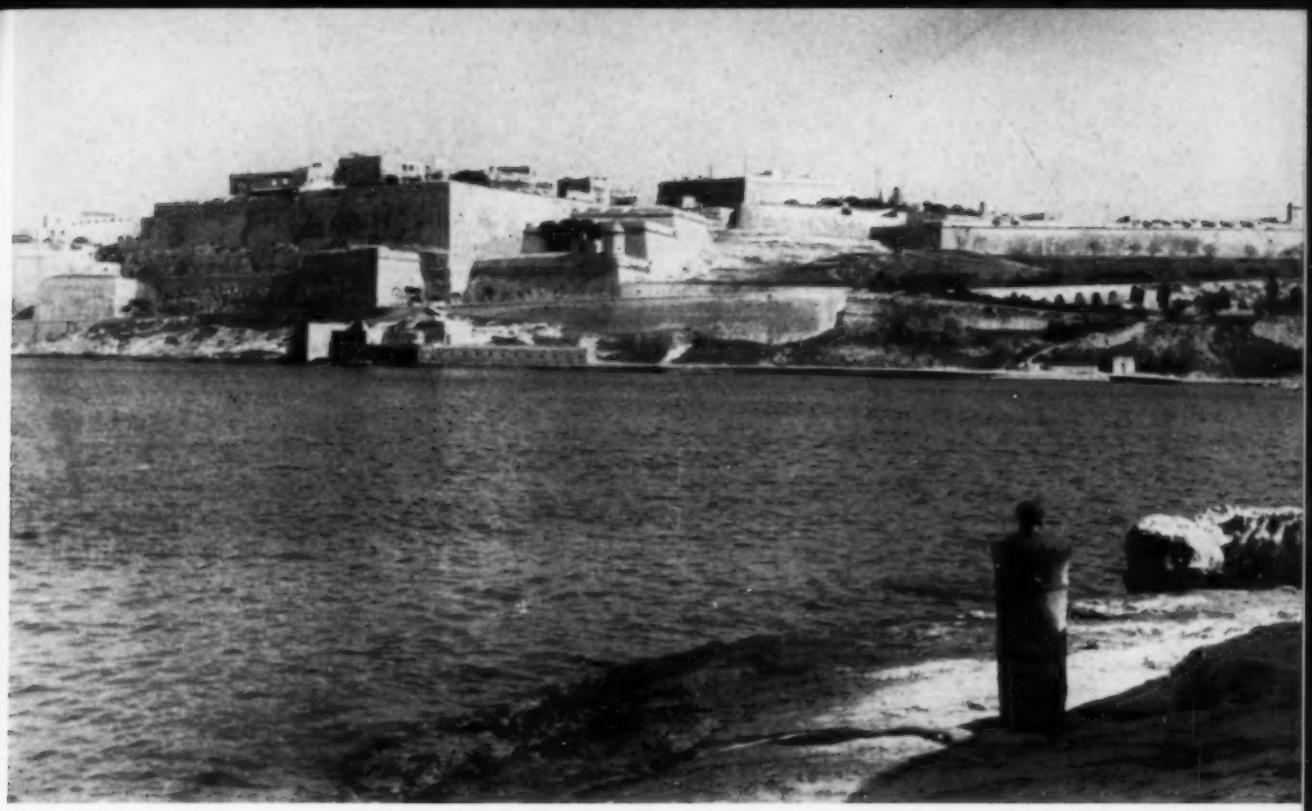
lace and pottery give colour to the scene. During the spring months, when oleanders are everywhere in bloom and the bastions are ablaze with bougainvillea, the stalls of the flower sellers are filled with almond and peach blossoms, marigolds, narcissi, carnations, jonquils, stocks, freesias, roses and lilies. Sunlight is usually brilliant and rather painful to those unaccustomed to its reflection on the light stone buildings, although rain during the winter months is frequent.

For two-thirds of the year the temperature ranges from 50° to 70° F. in the shade. Between June and September it varies from 70° to 90°, and August is the hottest month of the year. The daily average of sunshine in summer is eleven hours, in winter five hours, twelve minutes. Winds from the north-west are always strong and cool, but the *scirocco* from the south-west frequently brings with it large quantities of Sahara dust. Its humidity is exceptionally high and for days together the weather is often damp and close. The heat in August is overpowering. Visitors from other parts of the world have found higher temperatures in drier climates less trying.

Rainfall averages from twelve to twenty-seven inches in the year and waste rain water is carefully collected by farmers into sunken wells. In 1883 it was discovered that drinking water lay in a limestone strata in many localities at and above sea-level, and by tunnelling, no less than 1,500,000 gallons are now raised daily by pumps into reservoirs and carried by aqueducts over the island. The water rate is very low.

The soil is shallow, but rich in phosphates. Every available piece of fertile land is cultivated and agriculture is an important industry. It is, however, Malta's north-east coast which has made this little island unique in history, for the many natural harbours, which its creeks and inlets provide, have attracted the seafaring nations of the Mediterranean from time immemorial.

Malta is one of five small islands, composed of a series of nearly horizontal layers of crystalline, granular or earthy limestones, bedded on greensand and stiff blue clay. Admiralty plans show the Maltese archipelago as the crest of a submerged bank dividing the Mediterranean into two deep hydrographical basins in each of which are depths exceeding 2,000 fathoms. The bank is nowhere at a lower depth than 300 fathoms from sea-level: a low tide of about 50 fathoms would unite Malta with Sicily, and one of 200 fathoms with Africa. The fossilized remains of huge reptiles, pachyderms, prehistoric birds



The harbour and walls on the north-west of Valletta.

Photo by Elizabeth Ingle

and fish, of dolphins, sharks, sea-eggs and shells, and the skeletons of elephants and hippopotami, discovered in the strata in all parts of the islands, speak of many early earth movements and confirm the supposition that the Mediterranean was once a fresh-water lake.

No one knows when man first settled in Malta. Many traces have been found of cave-dwellers along the sea-coasts and in the ravines. Human teeth have been discovered which, it has been claimed, date from the Mousterian cultural period of 40,000 B.C., and pigmy flints dating from 12,000 B.C. Space does not permit an exhaustive account of palaeolithic and neolithic relics. Malta was in the very centre of that movement which produced buildings of the megalithic type and may have been the centre from whence that movement spread. The remains are of form and proportion unknown elsewhere and indicate the existence of a highly developed civilization. Over the countryside, in remote places, are solitary monoliths and menhirs; dolmens, consisting of huge tablestones upheld by three or more others; and the ruins of what may have been sanctuaries, fortresses or dwellings dating from 3,000 B.C. — walls of cyclopean stones enclosing spaces roughly elliptical, with huge recessed jambs upholding bulky lintels in every doorway and niche. The height of all entrances indicates that the man of this period was not much more than four feet.

In one part of the island are a number of parallel V-shaped grooves, evidently worn by the passage of carts for thousands of years, running sometimes in single pairs, sometimes in groups from valleys to plateaux. It is believed by this evidence that even prehistoric man treasured the scanty soil, carting it from the low to the high levels by the only means known to him. And not far from the sea in the southern part of the island is the Hypogeune, a remarkable set of underground caves and passages, flint hewn from the solid rock, an ingenious arrangement of chambers with walls highly finished and decorated with designs in red ochre which must have taken many years to complete and can have been planned and executed only by a deeply religious community.

The visitor to Malta will be bewildered by the number and variety of its historical monuments. Phoenician, Greek, Carthaginian, Roman, Arab, Norman — all have left some mark of their occupation and influence. The rock-tombs of the Phoenicians, who named the island 'Malet', meaning shelter, and under whose rule it became a thriving commercial centre,

Hajar Kim.

Photo by M. E. Nockolds

The Hypogeune a remarkable set of underground caves and passages

Another view of the Chambers in the flint hewn underground temple.

Photos by Edward A. Gouder

are numerous and scattered. On the Bourg promontory which lies opposite the promontory where Valletta now stands in the Grand Harbour, they built a temple to the goddess Astorath, which the Greeks are said to have rededicated to Aphrodite, and the Romans to Juno.

It is generally believed that the Greeks occupied Malta about 700 B. C. although there is little evidence to support this theory. The island of Gozo, north-west of Malta, is thought to be the "Ogygia" or the Island of Calypso referred to by Homer, and one cave on its shore is still known as Calypso's Cave. But the marks of Roman occupation are many. Malta was a Roman garrison for over 600 years. The remains of villas are to be found in several villages and near the old capital in the centre of the island are Roman Doric columns, mosaic pavements, plinths and friezes which were possibly once part of the residence of Malta's Roman Governor.

In 60 A.D. St. Paul was shipwrecked on the north coast and Christianity spread rapidly. Catacombs remain to tell the same story of persecution and faith as do those in Rome. But in A.D. 870 the Saracens were sweeping over the Mediterranean and Malta fell under their domination for more than 200 years. The Arabs destroyed the pagan temple on the Bourg in fortifying the point. They taught the Maltese stone-mason to construct four-centred, horseshoe and multifoil arches, to carve geometric, fretted arabesques, and their influence can still be traced in some of the carving which adorns the houses built after Count Roger of Normandy had conquered Sicily and subdued the Arabs to his rule in 1090.

In 1127 the Arabs were finally expelled from the island and Malta became part of the kingdom of Sicily, subject to its laws and customs and following its main historical vicissitudes. A record of this period may be followed in the old Siculo-Norman houses which are to be found in the harbour towns and in the old capital. The houses are of two simple stories with typical Gothic arches to door and window openings. The stories are marked by cornices of triangular-shaped corbels. Walls are of incredible thickness and often contain secret passages. Rooms are high and wide but dark, for window openings are relatively few. Many ghosts are said to haunt these old houses.

The old capital inland is a bewalled city of medieval enchantment lying 800 feet above sea-level, with magnificent views from its ramparts over terraced fields to the coast. On its present outskirts lie the catacombs and the remains of the Roman house. The Arabs fortified it and called it M'dina. During Sicilian rule its title was changed to Notabile and when Valletta was built it became known as Citta Vecchia.

The building of Valletta did not begin until 1566. At the commencement of the sixteenth century, when Italy was afire with the New Learning and Luther had begun to protest against the abuses of the Roman Catholic Church and the Turks were disturbing Christendom in the Mediterranean, Malta was still untouched by these revolutions, and the site of its present capital was an uninhabited promontory known as Mount Sceberras on the north-east coast. But in 1523 the Turks drove that ancient, religious Order, the Knights Hospitallers of St. John of Jerusalem, established during the Crusades in the eleventh and twelve centuries, from their convent in Rhodes, and in 1530 the Emperor Charles V ceded the Maltese Islands to the Order.

The Knights of St. John brought the culture of Renaissance Europe to Malta. Towns immediately sprang up around the harbours where there was such excellent accommodation for the Knights' large fleet of galleys. From the villages on the Bourg and its companion promontory, Isola, grew the cities Vittoriosa, Senglea and Cospicua. But soon after the arrival of the Knights in Malta the Turks made a determined effort to exterminate them. The Knights were pledged to defend all Christian nations in the Mediterranean from the Infidel Turk, and their galleys sailed regularly in search of Turkish vessels which they captured and plundered without conscience. For four summer months the Bourg was besieged. The Turks slashed the bodies of their victims with the mark of the Cross and floated them into the Grand Harbour past the despairing Knights. The Knights retaliated with Turkish heads as cannon balls. They endured amazing hardships, shortage of food, ammunition and men, but under the fine leadership of their Grand Master they eventually triumphed, and scenes illustrating this remarkable battle now decorate

A side street in Valletta.

the frieze of the Chapter Hall in the Grand Master's Palace in Valletta.

The Knights, under their Grand Master de la Vallette, then set about building a strongly fortified city upon Mount Sceberras. Their original scheme was to level the undulating surface of the promontory to a platform on which a gridiron plan of streets was to stand, surrounded by ramparts scarped down to the water's edge. But the rumour of another Turkish invasion interrupted the work so that the transverse streets were cut straight over the mount without levelling, sloping steeply away from the centre of the town, as they remain to this day.

Throughout the years of their occupation the Knights never ceased in their efforts to make Malta impregnable. Nothing is more compelling to the visitor than Malta's enormous bastions. Building material was abundant. The varieties of limestone are easily quarried and easily worked, and with the aid of the best engineers of their time the Knights devoted an enormous amount of their wealth in

A Maltese vegetable hawker.

Photo by Elizabeth Ingle

A Maltese farm.

money and slaves on improving the defence schemes until the fortifications were the wonder of Europe. They excite our awe and admiration to this day. One of the first fortresses to attract the visitor's attention as he enters the Grand Harbour is the Fort St. Angelo which guards Vittoriosa on the Bourg. A study of this formidable fort alone would reveal the story of Malta from the days when the Phoenicians built their temple to Astorath on the site.

The Knights, however, not only fortified the island, but built themselves splendid palaces and cathedrals, and coaxed luxurious gardens from the stoney soil. They constructed ingenious underground pits for storing grain — these pits are used to-day for the same purpose. They built reservoirs and fountains, and an aqueduct to carry water from the centre of the island to the coastal towns. Their auberges, chapels, private houses, their hospital, law courts and library in Valletta are in an excellent state of preservation and still in use. Their influence was marked and

Old and New. Shoulder of a bastion seen from ditch level through a modern archway.

Photos by Elizabeth Ingle

A coast view.

lasting. Maltese nobles followed their example closely and Renaissance and Baroque architecture are to be found in every small town throughout the island. Over the doorway of one remote farmhouse was discovered a remarkably carved lintel—evidently the work of some inspired native craftsman whose name is lost to posterity.

The story is inexhaustible. Gradual development of commercial interests and alliances in Europe destroyed the Knights' major occupation of defending Christendom in the Mediterranean against the Infidel, and their monastic, military mode of life gave way to one of luxury and ease. We find this change expressed in their buildings of the eighteenth century of which the Spanish rococo Auberge de Castille is a spectacular example. When Napoleon arrived in 1798 the Order had grown too effete to offer any resistance and the keys of Valletta were handed over without a struggle.

French rule lasted two years. In 1800 the French capitulated to the allied English, Maltese and Neopolitan forces, and Malta became part of the British Empire which it has remained ever since.

The British Fleet has sheltered in the harbours of Malta for over a hundred years. All educated Maltese speak English fluently although the percentage of illiteracy is still very high. English currency has been legal tender since 1866. Self-government, on almost Dominion status, was granted in 1921. The proportional representation system continued until 1927 when a newly formed Constitutional party was returned in the Legislative Assembly. But party contests and religious quarrels — the Maltese are a hundred per cent Roman Catholic and the power of the Church is consequently enormous — during the years that followed led to a suspension of the Government by the British Governor in 1932, and an 'Interim' Government, with an Executive Council under the Governor as Chairman was in power until 1939, when partial self-government was restored.

The principal existing industries are agriculture, lace, soap wine, beer and tobacco. About 114 square miles of land are under cultivation. In 1935 it became compulsory for builders to transport soil found during excavations to places notified by the Government and 200,000 cubic yards of good red soil have since been recovered and used to reclaim or improve over 100 acres of land. Fields are terraced and divided by stone walls over which scrawls the black, ubiquitous carob. Crops include wheat, barley, potatoes, beans, onions, tomatoes, oranges and lemons. Many small farmers hawk their produce, and vegetable carts are a familiar sight in the towns and suburbs.

The citrus groves are oases of green during the summer, but their production does not meet the needs of the island as large quantities of citrus fruits are imported from neighbouring countries. During the dry season the farmer cultivates such crops as vegetable marrow and melon and, for his own use, the prickly pear, which needs no encouragement. Farmhouses are square built and flat roofed with very few windows in the outer walls. The principal rooms usually open on to a central courtyard where all live stock are housed.

Every Maltese worker keeps fowls, if he can, even in the towns where they are couped in cellars or on roof tops, but the poultry trade, although it has possibilities, has not been developed. Cow's milk, since there is little or no pasturage, is a rare commodity, but goats have, for a long time, been a typical feature, and the pasteurization of goat's milk has recently been brought into effect in certain urban areas.

The Mediterranean is well known to be rich in fish, but economic conditions have hindered the development of this trade in Malta also, and fish are imported from the home ports and Newfoundland. Owing to the rocky bottom of the Mediterranean, trawlers cannot be used and the Maltese fisherman cannot afford the equipment for deep-sea fishing which is at present almost exclusively in the hands of Italians and Greeks. For coastal and harbour work he uses lampara nets which he makes of twigs and repairs himself. Fishing boats are brightly painted, and a colourful addition to Maltese waterside life is the vividly decorated *dghaisa*, or

row-boat, with which many Maltese make a living by conveying passengers across the harbours or to and from ships and quayside.

The salinity of the Mediterranean is very high. Sea water is collected in large pans exposed to the sun and the salt obtained used for cooking purposes. The salt deposits around the coast are reminiscent of the white alkali deposits found on the edge of pools in the dry belt of British Columbia.

Lace-making, cotton and linen weaving are other interesting industries, although through the sale of a cheap silk thread, Maltese lace lost, in the past, much of its reputation for quality.

There is a certain amount of profitable tourist traffic, but entertainment for the tourist does not at present extend much beyond sight-seeing excursions and sea-bathing. The British Services dominate social life. Clubs and cliques flourish and tennis, golf, hockey, polo and yachting are the nearly exclusive amusements of Service circles who are apt to dismiss the history of the island with a bored lift of the eyebrow.

Malta is at its best in spring. Winter storms of wind and rain may linger into April and May but the sun shines frequently with increasing warmth, the air is crystal clear, sap is rising, and there is a universal burst of blossom and leaf. Among the famous gardens of the Mediterranean several are to be found behind high stone walls in Malta. Many varieties of sub-tropical plants and every kind of English spring and summer flower is grown. The grounds of the Governor's Palace of San Antonio — once a summer palace of the Grand Masters of the Knights of St. John — laid out in citrus groves, rose gardens, lily ponds, long walks and borders, are open to the public all the year round. For those who are interested, Malta yields unlimited treasure. It is an island of vivid, changing colour, a volume of legend and fact which, once seen and read, is not easily forgotten.

Herd of goats in an old corner of Valletta.

Senglea, one of the fortified cities in the Grand Harbour.

Photos by Geo. Furst

Artists and poets have long admired the rugged beauty of Maritime fishing villages. Now the Adult Education Movement is examining their economic status as a whole, their chance for survival as production units in a highly competitive industry.

THE CO-OPERATIVE MOVEMENT

by **EVELYN S. TUFTS** *Photos by Canadian Geographical Society.*

AMONG the important social and economic developments taking place in Eastern Canada during the past decade, none has attracted as much attention or achieved such significance as the Co-operative Movement, under whose direction hundreds of groups in rural communities and small towns are now doing their own banking, processing, merchandising, and distributing, and, in some cases, bringing about a real renaissance in the field of primary production.

The movement owes its soundness, as well as its promise of endurance and permanence, to the fact that it was preceded by, and is associated with, an adult education effort of unique design and far-reaching influence.

The latter had its inception within the walls of a small Nova Scotia University, that of St. Francis Xavier, situated at Antigonish, in the eastern part of the province, where the majority of the people are engaged in farming and fishing. This modest institution, which has a normal enrolment of less than four hundred students, has, for the past eight years, been carrying on an educational programme unparalleled in academic circles in the Dominion.

Nova Scotia has always had plenty of education, of a sort. There are four

Top left:—Long famed for their picturesque appearance, in recent years some of Nova Scotia's quaint fishing villages have become the laboratory for a social experiment in adult education and co-operative enterprises. Many, however, are still to be organized.

Left:—Road to a well-known fishing village in Halifax County. The rocky nature of the terrain in many sections prevents any agricultural pursuits by which fishermen can supplement their incomes.

universities and a number of small colleges with degree-conferring powers. These turn out, year after year, many able men who have become leaders in their chosen fields, and have carried the name and fame of Nova Scotia into the far corners of the earth. There have been free public schools in Nova Scotia for over seventy years. But, unfortunately, only about two per cent of the people graduate from the universities, while the great bulk of young Nova Scotians leave school at grade six and seven, to go to work in the fishing boats, on the farm, or to seek employment in one of the industrial towns. And, in spite of free schools and compulsory attendance regulations, thirty-five thousand Nova Scotians, according to the last Dominion census, still cannot read and write.

Equally unfortunate is the fact that the type of education provided by the average school in the past did not fit the great mass of the people for life as they would presently encounter it. They were taught a few abstractions, a smattering of languages and mathematics in schools originally designed largely as preparatory schools for the universities. Survey after survey revealed that, for practical purposes, such as making a living, or for developing their potential talents, skills and abilities, the great majority of Nova Scotians had, in one sense, no education at all.

It was for this big population group that, some years ago, St. Francis Xavier University decided to provide some practical education, beginning with a few of the poverty-haunted and disheartened communities of its own diocese of Antigonish. It was not designed as education for the so-called "professions". It was education for the pit-head, the long wall, the open hearth, the dory, the salting shed, the lobster cannery, the potato field, the lumber woods, and the lathe. It was education, to put it bluntly, for the working classes. It was education in elementary economies, in sociology, and where necessary, in the three R's. It was education suited to average life in Nova Scotia in the year of Our Lord, nineteen hundred and thirty, and onward.

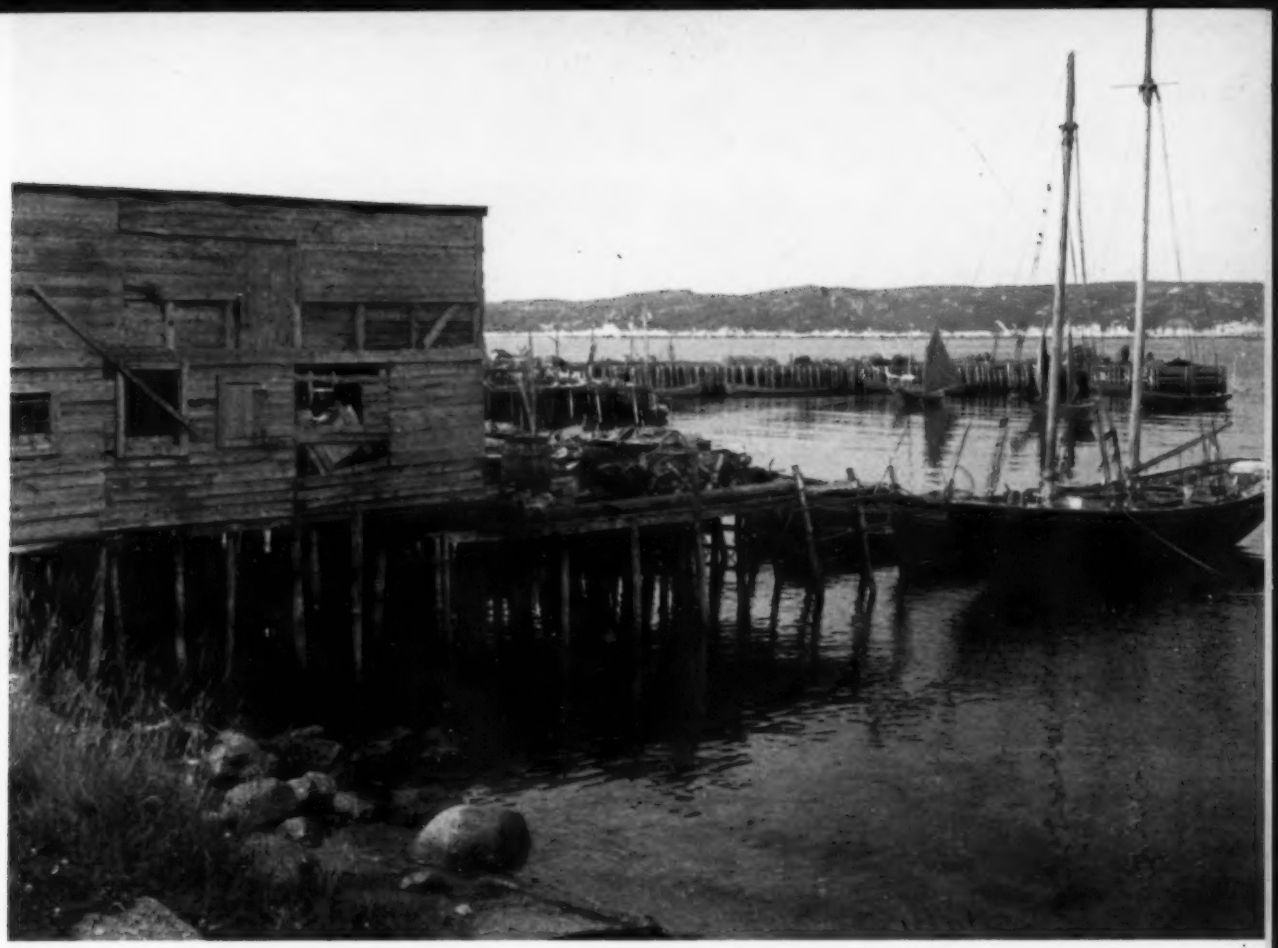
Established to carry out this work in 1929, the Extension Department of St. Francis Xavier, partly by accident, hit upon the Swedish plan of the small community study club as the best means of spreading adult education among the fishing and farmer folk of Antigonish. Following mass meetings and many public addresses, over a hundred of these clubs, which both men and women joined, were organized, and began to meet in the homes, the school-house, the parish hall. To-day, thousands of these organizations blanket the Maritime Provinces from Chaleur Bay to Canso and Bay St. Lawrence, representing the active alumnae of what has become a great Folk-School, the University of the People.

In these homely class-rooms, Maritime folk are meeting weekly or oftener to discuss community problems, to examine the principles of community credit organizations, the processing and grading and marketing of fish, and agricultural and forest products. They are debating their neighbourhood's economic plight, whether it arises from unemployment, low commodity prices, or lack of cheap transportation. They are looking into the possibility of co-operative effort to effect a solution of them.

And indeed, some of these local problems are very great. For years, disheartened by the magnitude of them, many Nova Scotians solved them, individually, by the simple expedient of flight. For many decades, the average rural Bluenose, as soon as he achieved long trousers, promptly emigrated, preferably to the New England States. As a rule, he never came back, unless he had prospered financially sufficiently to retire. Prince Edward Island lost one whole generation to the United States in this fashion, Nova Scotia, practically as many.

The Maritime Provinces retrograded economically, until in Nova Scotia forty

Left:—Fisherman's house at Terence Bay, Nova Scotia. Along with the establishment of study clubs and the setting up of a Co-operative Credit Union, nearly every house in the village has been painted or whitewashed, for the first time in years.



To the run-down inshore fisheries of the Maritimes, the Co-operative Movement brings new hope and new life. This scene is typical of many such villages from Chaleur Bay to Canso.

per cent of the farms were abandoned. The per capita wealth of that province, once the highest in the Dominion, sank until it became the lowest. The miners were restless and discontented, the fishing industry declining to a point where some communities faced near-starvation. It was the fashion to blame these things on Confederation. Geography, so the Maritimers said, was against them.

In 1927, a Royal Commission, appointed to examine the alarming state of the fishing industry in the Maritimes, recommended adult education and co-operative effort among the fishermen as one means of staving off imminent collapse. Dr. M. M. Coady, of St. Francis Xavier, was appointed to organize them. The Extension Department of the University, taking definite form shortly after, soon extended its educational range into wider fields, including the important industrial area of Cape Breton, spreading its bright web of enlightenment and learning into even the most backward communities, Protestant and Catholic alike. Designed originally as a mere parochial project, the Co-operative Movement in the Maritimes presently became wholly unrestricted in its scope, and completely non-sectarian in its character.

One of the first and most important fruits of the study clubs was the credit union, since the most vital problem of every community is the lack of available credit for the small borrower. Starting in 1933 in the mining town of Reserve, Cape Breton, these "people banks", whose assets represent the pooled savings of their local communities, now number 189, with an estimated membership of 28,000 people, and a total capital of $875,000. In Nova Scotia alone, annual loans, practically all in small amounts, run as high as $1,000,000.

The credit union was adopted as part of the Adult Education Movement programme because the Extension Department saw in these community banks a simple form of co-operative enterprise that would not only teach the rudiments of economic and social co-operation, but also provide the necessary capital for other mutual and self-help projects.

Credit unions had already been tried in Canada, having been introduced into Quebec in 1900 by M. Desjardins, and had spread across the border to New England, where the well-known philanthropist, Mr.

Edward Filene of Boston, had been their chief sponsor. On invitation, Mr. Filene's personal representative, Mr. Roy Bergengren, went to Antigonish, and at a conference there, explained the benefits accruing to the establishment of these institutions in both rural and urban communities.

From the backing provided by the credit unions have come the forty-three co-operative stores now functioning in the Maritimes, whose business, conducted strictly on a cash basis, now runs into several million dollars per year. In addition, there have been established many scores of co-operative buying clubs, canneries, creameries, turkey pools, wool circles and calf clubs, owned, conducted and financed by the people themselves. Co-operation in the producing, handling and marketing of pulpwood, livestock, poultry and dairy products is bringing better returns to primary producers, and increasing their purchasing power. The credit unions, meantime, are providing needed credit facilities, encouraging thrift and cash buying, training people in systematic saving.

Though undertaken at first merely with the object of improving the educational status, and through that, the economic well-being of the folk of their own diocese, the founders of the "Antigonish Movement", as it is still called, soon became convinced that if the work could be universalized, the whole social picture of the Maritimes could be changed. As the story of the advantages of the co-operative approach to community problems began to spread, the neighbouring provinces of New Brunswick and Prince Edward Island joined in, enacting legislation permitting their citizens to participate. By 1939, New Brunswick had twelve credit unions with assets of $238,000 made up, as in Nova Scotia, from small deposits, representing the tiny savings of humble working folk, often no more than ten or twenty cents a week. The Maritime credit unions, from such small beginnings, will presently be computing their annual loan turn-over in millions.

The pattern followed by all the Maritime Co-operatives is nearly a century old, but the basic principles are religiously preserved. Co-operatives in Europe began in 1844, with a little group of starving weavers in Rochdale, England, who banded themselves into a group known as the Equitable Society of Rochdale Pioneers, which had twenty-eight members and $140.00 in cash. This was the mother of the great British Co-operatives, which to-day have reached monumental proportions. The outstanding characteristics of all these societies is open membership, the rule being, one member, one vote, regardless of the number of shares held, and the return of all surpluses in the form of dividends to the members, in proportion to their patronage. These fundamental regulations obtain in all the Maritime Co-operatives.

The chief requirements for membership in a credit union are good character and industrious habits, and it is on this basis that loans are extended, rather than on the type of "security" available from the ordinary banking standpoint. Full membership in the local credit union thus becomes, in many communities, a sort of social distinction, a hall-mark of good citizenship. The town drunk, the village wastrel, the double-dealer and the ne'er do-well, these are not eligible to join. These considerations, together with the sense of community obligation implicit in such organizations, no doubt account for the almost infinitesimal losses on loans incurred in the operation of the credit unions.

Prince Edward Island, for instance, in a recent report, revealed that out of $111,000 loaned by their credit unions in the past two years, the loss was $4.36, or four one-thousandths of one per cent. In general, losses from bad loans in any of the Maritime Co-operatives are incredibly small.

Credit union shares are usually five dollars each, and members may pay for them by instalments of as little as twenty-five cents weekly. There is no colour bar or age limit set for membership, the oldest so far being a great-grandfather of ninety six, and the youngest a babe of six months. Hundreds of children belong, depositing their dimes and nickels with laudable regularity. In one small parish the children have saved up several hundred dollars in this fashion, and are about to buy shares in the local co-operative store. Each credit union receives a charter from the Provincial Government, and all profits revert to members after twenty per cent is set aside for the guaranty fund. All co-operative enterprises contribute a certain percentage of their surpluses to help extend and carry on adult education, which is the arch and keystone of the whole movement.

While the co-operatives are now to be found in nearly all sections of Nova Scotia, it is in the fishing villages, where they began, that they have effected some of their more striking benefits. It will not be long now, for instance, before they will have complete control over the export of live lobsters, a business which amounts to nearly $5,000,000 a year. Fishermen have been able, by co-operative marketing, and buying of supplies, to double, and sometimes treble, the prices they formerly received from dealers for live lobsters. In addition, fishermen now own and operate thirty-five co-operative lobster factories, serving about ninety communities. New Brunswick, which produces five million pounds of smelts a year, now has twelve co-operative smelt-marketing organizations, which are revolutionizing the whole industry.

Working in co-operation with the local and federal Departments of Agriculture and Fisheries, the fame of the movement has spread far beyond the confines of the Dominion, enquiries as to the various projects having been received from countries as far distant as Turkey. At the annual conference at Antigonish last August, twenty-eight of the States of the Union sent representatives and observers, including a delegation of forty students and professors from Columbia University. British Columbia is now being organized on the Antigonish pattern, and Manitoba recently invited Professor A. B. MacDonald, Assistant Director of Adult Education at St. Francis Xavier, to make a lecture tour in that province to explain the Movement.

Good neighbour and generous friend throughout has been the Carnegie Corporation of New York City, stout supporter of adult education on this continent, and which has given invaluable advice as well as financial support to the Maritime effort, including a special grant to establish regional libraries on Prince Edward Island. Popular demand for more and better books is one of the most striking and encouraging tendencies which can be directly credited to the study clubs.

So far as Nova Scotia is concerned, the cultural and economic awakening among its primary producers could not have happened at a more fortuitous time. For with the road to the once wide-open and contiguous American labour-market now completely closed, that province is faced, for the first time in years, with the prospect of a definite population increase. For the first time in decades, Nova Scotia, thrown on its own resources, must consider, in all seriousness, whether or not it is capable of establishing a sustaining rural economy for the support of all its people. The same is true of New Brunswick and Prince Edward Island.

Young men and women, barred from the green pastures to the south, must now sit down and do what no generation before them, since the close of the Revolutionary War, has had to do.

Heirs to the escapist and defeatist complex of a host of *émigrés*, they are now obliged to examine, calmly and dispassionately, the fishing cove, the run-down farm, the little mining town where they were born, to see what the chances are of making a living there; to see, as well, what the chances are for living a satisfactory life, for enjoying some of the modern comforts and cultural privileges of the wonderful age in which we are living; to see, in short, if the land that bore them can sustain them in dignity and comfort, promise them security for the World of To-morrow, and "that unhoped serene" which men call age.

To these anxious young people the Adult Education Movement seems a veritable life-line, a spar to cling to in an ebbing tide.

Hence a further reason for the tremendous spread in study clubs, the almost frenetic enthusiasm for up-to-date information, the demand for books and pamphlets on every imaginable subject, from canning blueberries to building Diesel engines, from processing codfish to grading turkeys and improving the breeds of dairy cattle. Hence, too, the keen interest in classes on labour economics so widely attended every winter by the young men in the industrial towns, the demand for apprenticeships, for more technical training, more night schools. There are young miners in Cape Breton who have read forty volumes of biography and economics in a season, and have studied and brought into being one of the finest co-operative housing schemes to be found on this continent, and which might well serve as a model for slum-clearance projects everywhere. These things are symptomatic of the new approach to life in a section of the country whose people must now look

to their own environment for a livelihood, instead of seeking their fortune in a foreign land, must evolve their own culture, instead of borrowing it second-hand from their prosperous returning exiles, "down east" to spend the summer.

Certainly, the value of the Co-operative Movement in the Maritimes cannot be assessed in economic terms alone. To do so is to do its sponsors, as well as those directly participating in it, a great disservice.

It is actually a broad programme for the development of the spiritual, social and cultural potentialities of a whole people, regardless of race or creed. It is a move toward real democracy, based on the highest ideals of Christian brotherhood, and has proved, in one area of Nova Scotia, at least, a potent eradicator of Communism and class warfare. It has restored at least a modicum of ownership, and the pride and responsibility which goes with ownership, to thousands who, lacking any stake in the country, had no concern in preserving its institutions, no interest in its future destiny. It has made good Canadians of embittered immigrants, of our own dispossessed and maladjusted. It has prevented, to quote one of its great leaders, "the too rugged individualism of the few from destroying the individualism of the many." It has restrained unscrupulous local dealers and merchants, and driven out would-be exploiters. It has inculcated anew the old pioneer virtues of thrift and frugality.

But more important still, out of it has come the development of leadership among the people themselves, the uncovering of unsuspected capacities for business management, of mechanical talent and artistic skill. It has trained people to lean on themselves, and not on governments. Out of it has come, moreover, the breaking down of isolation, of intolerance, of political and religious bigotry. A generation is growing up in the study clubs that casts a wary eye at inherited prejudice, judges

Top:—Before and after. One of the direct results of adult education among fishermen has been a new interest in improving housing conditions. The same is true of the mining towns, where one co-operative housing scheme is already in successful operation.

Centre:—Lighthouse at Peggy's Cove, one of the most rugged sections of the Atlantic Coast.

Bottom:—Anglican Church at Peggy's Cove, Nova Scotia, fishing village noted for its beautiful scenery.

individuals and issues on their merits. From the beginning, the Co-operative Movement has kept itself wholly free from all political alliances or entanglements.

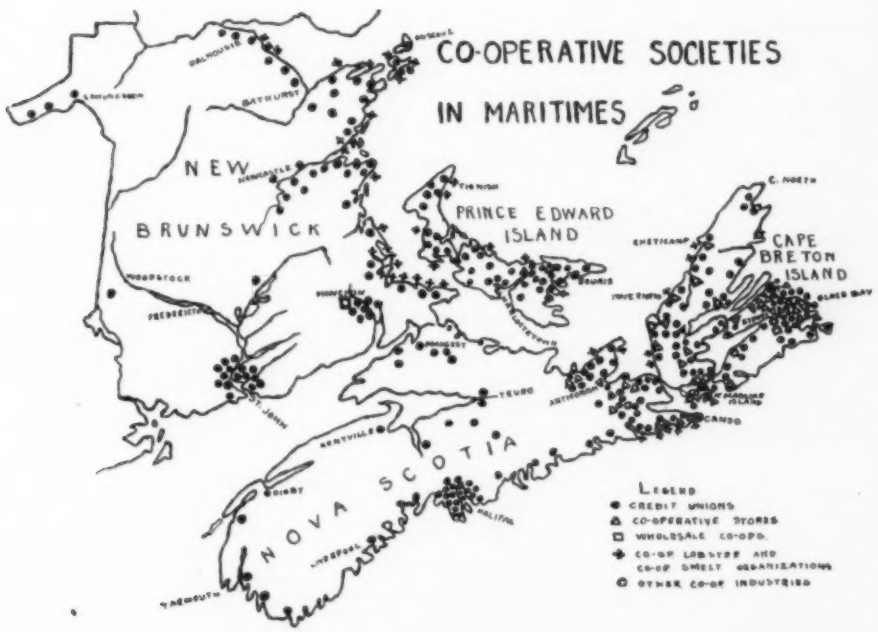
Out of the study clubs has come, too, an ever-increasing interest in cultural values, reflected in the widespread organization of dramatic clubs, debating societies, singing schools and orchestras, the growing demand for regional, exchangeable libraries, the increasing pre-occupation with housing projects, garden clubs, handicrafts and cottage industries in general. Experiments have already been made in co-operative hospitalization, and medical care. Nutritive values and preventive medicine are favourite topics in the women's clubs and are of special importance in rock-bound fishing communities where in some cases there may be only two cows to forty families, and there is so little earth that the villagers must go miles even to bury their dead.

To-day, with the war on, the Co-operatives are busy planning for greater production, preparing to do their part in supplying Canada's steadily increasing war needs, and helping to furnish the food products, which, in normal times, Nova Scotia imports at the rate of a million dollars a month. The special training given, through adult education projects, will be invaluable now in analysing soils, feeding farm animals, processing fish, preserving and canning surplus food.

The Co-operatives are confident, too, that, through the discipline and training provided by years of group study and group effort, that part of the Dominion will be in a much better position than some others when it comes to facing the industrial and economic upheaval which must necessarily accompany the cessation of hostilities in Europe.

They believe, further, that when this trying period of readjustment comes, the co-operative ideal may well be the little lamp which will best show the way out of the universal blackout. For they are convinced that the new European federation, which, it is hoped, will emerge from the debacle of exhausted warring states and violated frontiers, must, if it is to endure, be patterned closely on their own model of constructive progress through mass education and group effort, adopted from Finland, Denmark and the other more enlightened Scandinavian democracies, which long ago chose *The Middle Way* of co-operation as the only feasible path between unregulated capitalism on the one hand, and communism on the other.

Coincident with a great war effort, the Maritime Co-operatives are already looking ahead, and planning a long range programme for peace.



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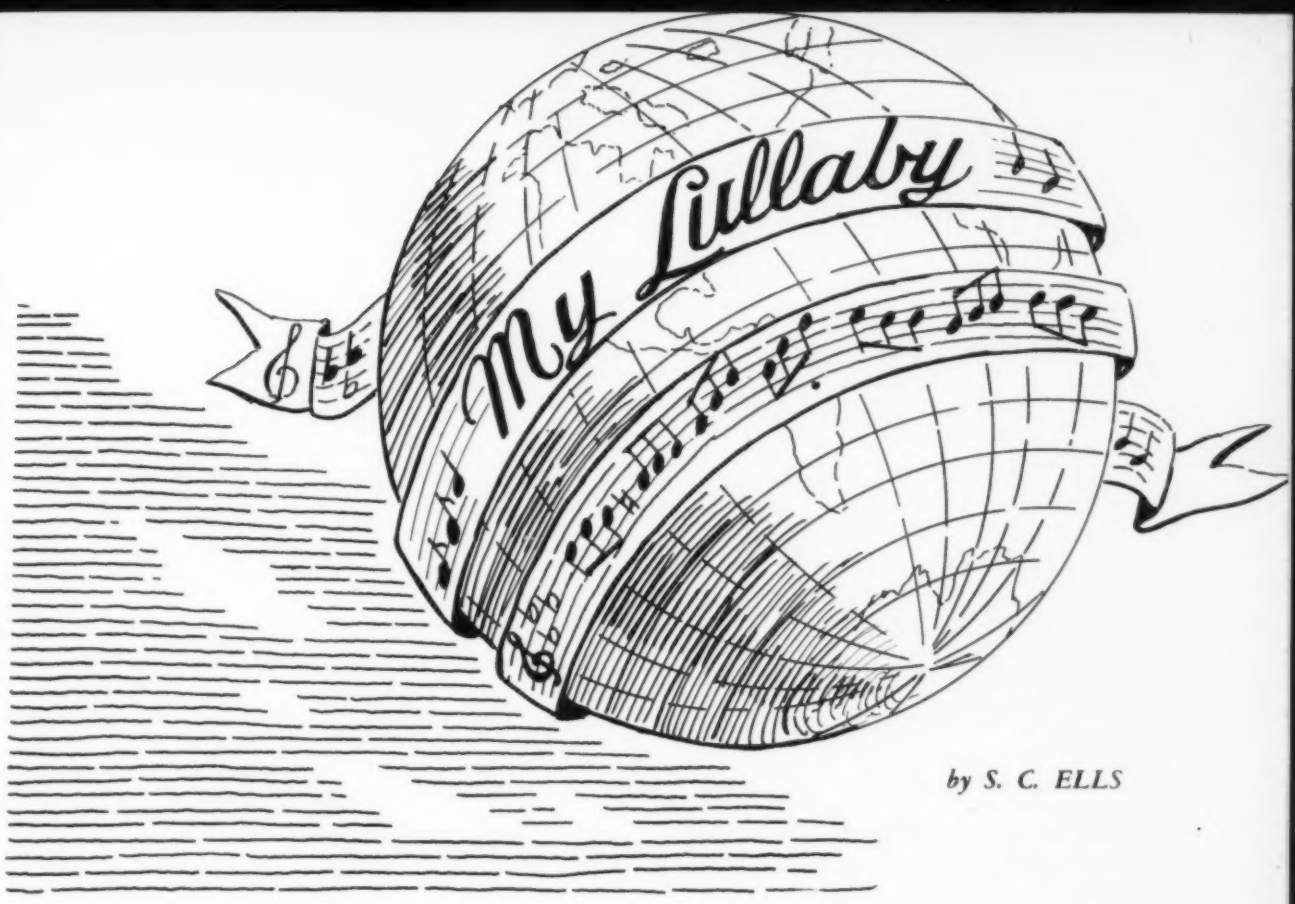


by S. C. ELLS

The childhood songs our mothers crooned grow faint across the years . . .
But under heaving deck or open sky,
Wher'ere they rest from toil or stress, each son of Martha hears
The soothing sound of his own lullaby!

* * * *

Thrumb of wind in cordage taut or thud of bladed wheel,
Or roar of foaming furrow at the prow,
In shadowy depths the steady throb of gleaming heart of steel
Are master lullabies of watch below;
There's lullaby in booming crash of seas on rock-bound shore . . . .
In strident scream of Winter's wailing storm . . . .
In snow a-hissing 'gainst the pane or rustling at the door
When men lie snug in sheltered cabin warm.

The crooning breeze thro' tufted boughs when shades of evening fall . .
On canvas roof the sound of pattering rain . . . .
The whispered gossiping discrete of leaves of poplar tall
Fall like some soothing lullaby's refrain;
A smelter's muffled murmur . . . . the voice of rumbling mills, —
Tall flame-plumed stacks and climbing tiers of light,—
Or toneless tolling bell buoy toiling over fog-blurred hills
Bring lulling reassurance in the night.

But give me couch of fragrant boughs beside some woodland stream,
That murmurs in a language that I know . . . .
While water's muted symphonies will weave a magic dream
As shadows dance to camp-fire's flickering glow;
For they whisper of bleak snow-fields . . . . of a thousand tinkling rills
Like silver threads mid frowning cliff and scaur,—
Of a growing stream a-winding mid rolling green clad hills,
Of a lake a-spreading o'er a valley floor;
Of shadowed pools . . . . of tossing foam a-flashing in the sun . . . .
Of birds a-homing 'gainst an evening sky . . . . .
And I hear a woodland vesper when the Summer's day is done,—
And my vesper is the water's lullaby!

* * * *

The childhood songs our mothers crooned grow faint across the years,
But under heaving deck or open sky,
Wher'ere they rest from toil or stress, each son of Martha hears
The soothing sound of his own lullaby!

EDITOR'S NOTE-BOOK

Frederick H. Peters, Surveyor General of Canada, in his introduction to "Completing the World's Longest Surveyed Straight Line" provides an illuminating historical sketch of an outstanding Canadian achievement in the survey world. Born in Quebec, he graduated with honours from the Royal Military College of Canada in 1904, and for nearly four decades has been engaged in survey work in Eastern and Western Canada and in the North-west. Surveyor General of Canada since 1924, he assumed the additional office of Chief, Hydrographic Survey in 1936. For the past thirty years, Mr. Peters has been engaged in the great task of making provision for the accurate surveying, mapping, and, since 1936, charting of our vast Dominion.

B. W. Waugh, from over a decade of experience in surveying the base lines and meridians in the outlying and unexplored districts of North-western Canada, presents in "Completing the World's Longest Surveyed Straight Line" a realistic picture of a vital pioneer service which our government servants are providing the people of Canada. Born in Ontario, Mr. Waugh is a Bachelor of Applied Science, University of Toronto, and a Dominion Land Surveyor. His survey activities have come under the direction of the Surveyor General of Canada since 1909, except for the 1914-18 war period. The writer's present ambition is to cover Canada with first-class, up-to-date air navigation charts.

Allan C. MacNeish, who contributes in this issue "Refrigeration — the Silent Service", deals with his subject as an expert. Born in Scotland, he studied Engineering at the Glasgow Royal Technical College and the University of Glasgow, Arts at London University, and Higher Accountancy at McGill University. His technical training has been supplemented by many years of practical experience in many fields in Great Britain, South America, the United States, and Canada. An accomplished writer of wide experience, he presents our readers with a comprehensive insight into the importance of refrigeration in our national economy in times of peace and war.

Evelyn S. Tufts, who writes on "The Co-operative Movement" has the distinction of being the only woman member of the Parliamentary Press Gallery where she represents the Halifax Herald. An experienced correspondent, she was one of the Empire journalists covering the Imperial Conference in London in 1937. The subject of her article is one of keen interest and stimulated by an extensive survey of the fishing industry in Nova Scotia. Her studies convinced her that the Co-operative Movement is a practical instrument for economic and social betterment among fishermen and other primary producers.

AMONGST THE NEW BOOKS

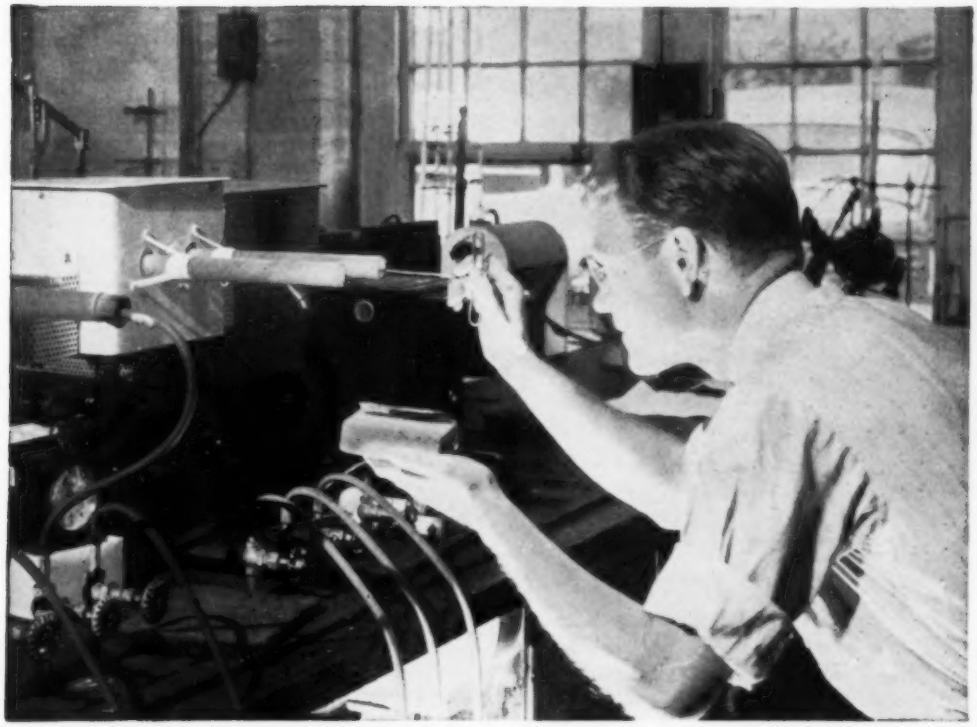
Letters in Canada 1939. This most valuable annual survey of the output of Canadian writers has again been prepared by the editors of the University of Toronto Quarterly. One opens the volume with pleasurable anticipation, aware of the competence of the editors in their several fields and with lively memories of the humour, the pungent and incisive criticism, the sound appraisal of values and craftsmanship which inform their essays.

Professor E. K. Brown writes a discriminating survey of the poetry of the year, noting in the better work "a new vigour and clearness in the presentation of social life". Collected poems such as Arthur Bourinot's *Under the Sun* and Alan Creighton's *Cross Country* are given more extended treatment while the work of other poets is discussed and compared; Miss Anne Marriott being awarded the palm as the author of the most impressive single poem of the year, *The Wind our Enemy*, "the first striking presentation in verse of the tragedy of drought".

Again we have Professor J. R. MacGillivray's delightful reviews of the year's fiction. Novels by Frederick Niven (*The Story of Their Days*), Frederick Philip Grove (*Two Generations*), Irene Baird (*Waste Heritage*) and two first novels, Ted Allan's *This Time a Better Earth*, and F. D. MacDowell's *The Champlain Road* are given pride of place in this section, which, however, deals constructively with many other less ambitious works. Some discussion of the short story might have been worth while. O'Brien has starred several Canadian short stories in recent annual volumes. Drama is ably and entertainingly reviewed by W. S. Milne who contributes much valuable information and constructive criticism.

To the reading public these realms of Canadian poetry, fiction and drama in English, have a measure of familiarity, if only through newspaper or periodical reviews, but the survey performs a very important function in placing before us the admirable work being done in many fields of literature by French-Canadians and New-Canadians. Fortunately, in Felix Walter and Watson Kirkconnell are found the ideal exponents and interpreters to English Canadians of the literary achievements of our gifted compatriots.

Under the heading, Remaining Material, a number of less well publicized aspects of the literary



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scene are surveyed by the Chief Editor, Professor Woodhouse, and various authorities whose services he has enlisted. Mention of some headings will suffice to show how wide a field is covered and how rich are our resources in the increasing number of scholarly writers dealing with all regions of human interest and endeavour. Among the most impressive are; Studies in History and Contemporary Background, Arts and Crafts in Canada, Biography and Auto-biography, Critical Essays, Writings on Religion, on Education, Comment on Current Events and Problems, Scholarship in the Humanities, Language and Literature, Theology, Philosophy and General Science, and the Social Sciences. Appended is a most useful and exhaustive bibliography covering forty-eight pages.

Chinese Bamboos by WILLIAM CHARLES WHITE (University of Toronto Press, $3.50).

This book is based on a collection of Chinese paintings in the Royal Ontario Museum. The author, who is Associate Professor of Archaeology at the University of Toronto and Keeper of the East-Asiatic collection at the Museum, describes Chinese bamboos, and shows their place in the every-day life of the interesting people. Stories and legends have grown about this tree which in all ages has been a leading theme in Chinese literature and art. The book includes translations of both prose and verse on the subject, and is beautifully illustrated with reproductions of paintings of bamboos from the collection of the Royal Ontario Museum.

Evangeline and the Evangeline Country, H. W. LONGFELLOW, with a descriptive and historical introduction by Joan Huntley. (Toronto: Collins, 1940, $1.00 cloth $1.50 leather). Not so many years ago visitors to Grand Pré saw few traces of the Acadians beyond an old well and its sweep and a row of French willows. Even then the spell of Longfellow's poem was strong, for here were the tranquil meadows, the distant marshes and the blue waters of Minas Basin dominated by grand old Blomidon of which the poet sang. Now it has become one of Canada's most beloved literary shrines, and travellers in Nova Scotia's lovely Annapolis Valley will find a beautifully tended park commemorating the story of a happy people driven from their home through a series of tragic misunderstandings. Collins of Toronto have published a most attractive little souvenir edition of Evangeline in large clear type, with sixteen full-page monochrome illustrations and two tourists' maps specially drawn by C. W. Jeffreys. An admirable introduction by Joan Huntley provides the historical background. Visitors to Nova Scotia will cherish this little book as a charming memento of their sojourn. No one can read it without longing to visit Acadia.

F. E. FORSEY.

Lure of the North by RICHARD FINNIE. *David McKay Co., Washington Square, Philadelphia.*

About twenty-five years ago Diamond Jenness, a world authority on American aborigines, spent a considerable time amongst the Eskimos of Victoria Island and Coronation Gulf regions. In his book, *The People of the Twilight*, Jenness described the life and characteristics of the Eskimos as they then were, when happy and untouched by the civilization of the white man. Attempting to visualize the effect of civilization on these people, he ends his volume with this thrilling query, "Were we the harbingers of a brighter dawn, or only messengers of ill-omen, portending disaster?"

Now, twenty-five years later, Mr. Finnie, in his volume, provides a record of some of the changes wrought during this intervening period — a period of rapid transition from the stone age to the age of mechanical appliances. His interesting series of sketches and essays of his observations while living amongst the Eskimos of the Western Arctic, and his recounting some of the stories of noted characters of the North make a valuable and interesting record of conditions during this transition period. He meets Ikpuckhuak, the lovable character with whom Jenness lived, and contrasts him with the present up and coming generation of igloo-dwellers.

In his chapter on Social Service, Finnie does not mince matters, perhaps he might have been even more outspoken when he describes the influence of varying, competing religious and commercial rivalries on the moral and mental condition of the natives. Living off the land, and "so simple are their real and basic material requirements that new artificial ones must be introduced by the traders to stimulate the trapping of more foxes", the natives have been provided with mental and material food they cannot thoroughly assimilate quickly.

What other changes besides material ones have been made in this transition period of Eskimo "advancement" is suggested by the observation that, in some districts, approximately twenty-five per cent of the population now have white blood in their veins. Mr. Finnie mentions some noted hybrids. Will this Euro-eskimo hybrid stock resist the imported diseases and be an asset to the Dominion, and "be able to work for (I do not like the implication in the word "for") and with us in the Arctic?" Perhaps another twenty-five years or less will tell, and the *Lure of the North* will still be such that a future author will be able to place his observations on record.

Read understandingly, Mr. Finnie's book provides a background for visualizing the conditions in the Western Arctic at the present and the near future, and, as the introduction says "it may awake the readers' sympathy for these lovable children of the Arctic".

The book is well illustrated with views and an excellent front and back map of the Arctic regions.

D. A. NICHOLS.

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Sea of Destiny, the Story of Hudson Bay, Our Undefended Back Door, by H. DYSON CARTER. (Greenberg, Publisher, Inc., New York, 1940. price $3.75). *Sea of Destiny* is a book with a mission. Even from the opening sentence the passionate desire of the author to show that Hudson Bay is the key to North America in peace or war is plainly seen. His sincerity and single-mindedness have assured the production of a forceful, almost a convincing, argument.

Propaganda? Yes, but delightfully written. An immense amount of historical research lies behind this volume, yet in his race against time the author has been unable to develop his case with cold logic—skipping from factual premise to fanciful conclusion. The result is a fabric whose warp is fact and whose woof is fantasy.

From the quaint conception that the Keewatin ice sheet actually gouged out the Bay to the bald statement that icebergs are a winter menace to navigation in the Atlantic, the evidence that haste and expediency prevailed over careful analysis is everywhere apparent. Embellishment and distortion abound, the offspring of a vivid imagination. How can one have faith in a writer who relates that the 1917 Halifax explosion eliminated that port?

Lacking weight as a serious study it has unquestioned literary and entertainment values. In the middle chapters particularly, the colourful and captivating style of the author comes to the fore. Here a series of breathless narratives whirl the reader from European court intrigue to the rude struggles of a new world and from the decorous board rooms of London to the hard-bitten trading posts of America.

By all means read this book, but be on guard. Enjoy the tales of knightly deed and dastardly plot, revel in its fascinating anecdotes; but treat with caution and suspicion its threat of dire misfortune yet to come.

P. E. PALMER

The Cod Fisheries — The History of an International Economy by HAROLD A. INNIS. (New Haven: Yale University Press, Toronto: The Ryerson Press; London: Humphrey, Milford; Oxford University Press, 1940, $4.00).

This book is a challenge to the imagination of the reader. It extends the frontiers of North America over a vast area that we have never thought of before as constituting a part of the continent — a thousand miles of misty sea yielding a harvest which for a long time rivalled in importance the produce of our wilderness, and which, even to-day, remains a world of its own in international economy, one in which the interplay of American, Canadian and European interest has created a situation unique in history. In exploring this great field, Professor Innis has opened many a chapter rich in half-forgotten history, and to most readers there will be that stirring spirit of romance in trade which must have been felt by those who stood on the wharves of St. Jean de Luz or St. Malo, to watch the home fleet return from the Grand Banks.

The heart of Professor Innis' study is the description of more recent times when a great part of the cod fisheries passed into the hands of the seaman of New England and Nova Scotia and became a matter of international concern between the two countries. Like the fishermen in whose schooners he sailed and with whom he consorted, the author keeps his eyes on the fish. It is for this reason that this volume occupies a place of its own in the series of studies of the "Relations of Canada and the United States". It is the only method of approach behind the facade to an understanding of disagreements or an appreciation of concessions in compromises. Research is not here denatured by practical exigencies, it is kept at its own task of discovering the hidden or little understood ways of men and nations.

The author shows the important part played by the cod fishing industry during the first stage of colonization. He describes the habits of the cod, the conditions under which it lives and tells us that "it appears to be one of the most prolific kind of fish". He spreads before us the whole history of the cod fishing industry since the time when the French and Biscaines found fishing-land fifty leagues off to sea from Newfoundland which they called the Bank. He leads us through the French expansion period from 1497-1550 followed by the rise of the English fish industry, whose greatest development dates from 1585 when the war with Spain kept the Biscaine and the Portuguese away from these waters. He shows Newfoundland depending more and more upon the cod industry, and England securing a strong and continuous hold on a product by which she obtained a share of the Spanish specie and the products of the Mediterranean. We then see the increasing importance of Newfoundland to the British Empire after the American Revolution, when the competition of the New Englander no longer existed. We follow the growing expansion of the fishing trade between Canada and the United States and the difficulties arising therefrom. In more recent times we see the aggressive policy of Canada in developing markets for fresh fish in Italy, Brazil and the West Indies. We are shown the "pull" of the continent which is made manifest by the importance of capital equipment essential to the development of the fresh and frozen fish industries. Salt has yielded to ice, and the schooner to the steamship, the railway and the trawler. We see that the increasing diversification of the industry in the more southerly areas, with wider markets, the possibilities of continuous yearly operation, and the availability of larger fishing resources, as offered by lobster, haddock, halibut, herring and other fish, has meant increasing mechanization.

This book, wich his a thorough study of the history of fish industry along the Northern Atlantic Coast of America, is very complete and interesting; it is well written and contains a wealth of valuable information.

J. HARDOUIN.

Guatemada, Past and Present, by CHESTER LLOYD JONES (University of Minnesota Press, Minneapolis, 1939, $5.00). A testimony of the authoritativeness of this illustrated work, which clearly must have involved a great deal of research, is the author's name. Chester Lloyd Jones, now Professor of Economics and Political Science in the University of Wisconsin, has long been a keen student of Central-American problems, as is proved by his other writings such as *Costa Rica and Civilization in the Caribbean*, and he has that indispensable background of knowledge for the pursuit of his studies which he acquired when representing the United States in various capacities, particularly as commercial attaché in Habana and at the Pan-American Conference there.

In the course of preparing this, his latest work, he visited the republic of Guatemala on four occasions in order to examine governmental records that are only now becoming available to students. *Guatemala, Past and Present* is the first analysis that has been made of the Guatemalan economy.

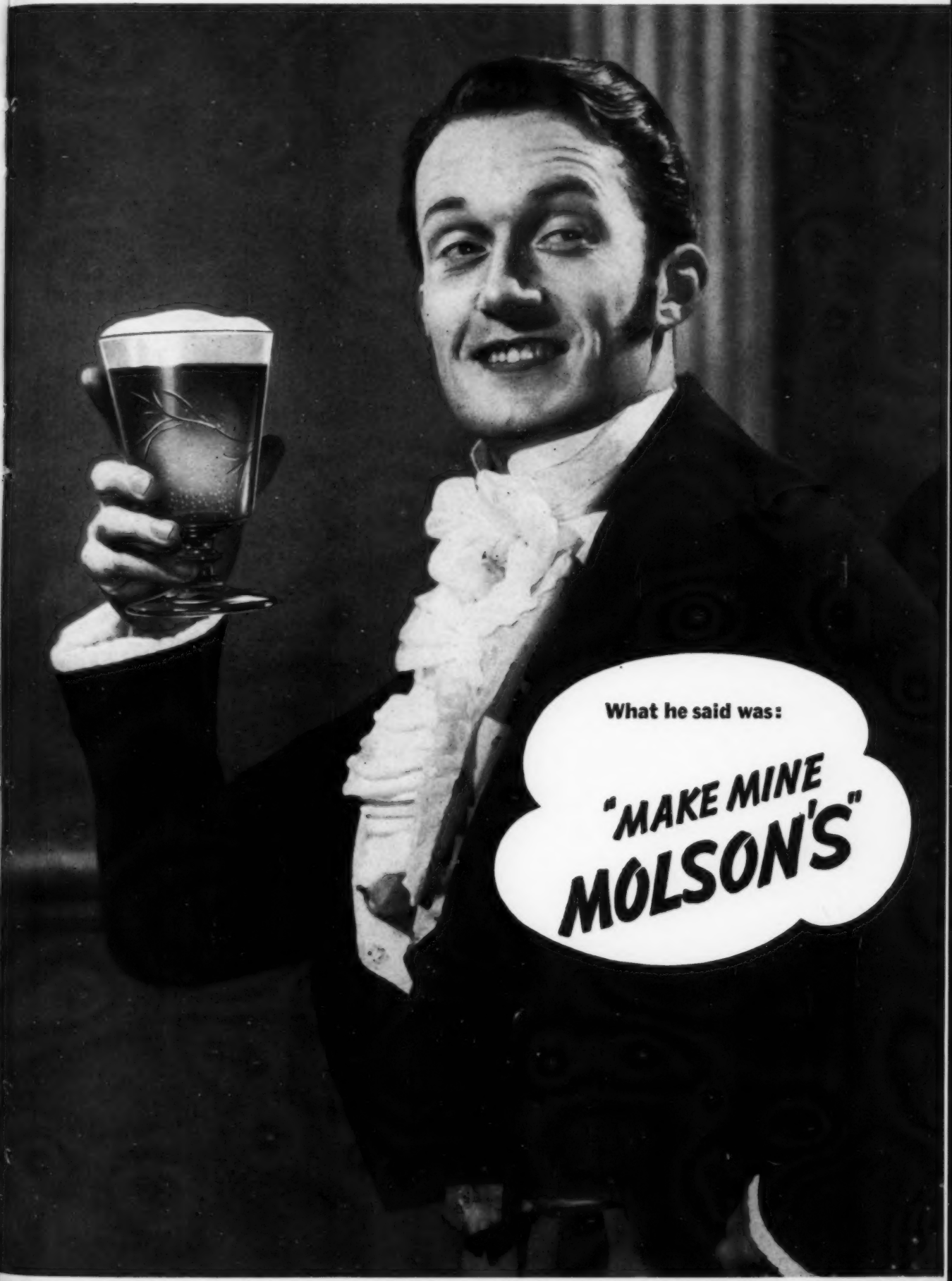
The subject is treated under three heads, Political Development, Economic Advance, and Social Life, followed by forty-six pages of bibliographical notes relating to textual passages, an eight-page bibliography, and finally the index, which is preceded by a note on Spanish pronunciation. The work has thus been made to serve also as a ready reference.

Every significant aspect in the history and development of the country is touched upon from the time, 417 years ago, when Pedro de Alvarado, on the order of Cortes, marched south from Mexico with a force of less than 700 to bring the land and its peoples under the Spanish Crown. The author concerns himself primarily, however, with the period subsequent to the organization of a Guatemalan state government after Central America had been freed from the shackles of old Spain in 1823.

In arriving at its present status, Guatemala has had an administrative career — thoroughly dwelt upon by the author — which is not without its important lessons for democracies and for all who are directly or indirectly concerned with the trend of the republic's domestic and international affairs. The period of "conservative reaction" when the country was dominated for thirty years by that extraordinary character of ignorance and superstition, Rafael Carrera, is in marked contrast to the liberal régime under Justo Rufino Barrios, which, "looked at in perspective, stands out in internal affairs as the most brilliant and constructive in Guatemalan history."

Two-thirds of Guatemala's population of 2,500,000 is made up of Indians, who present a problem, especially in labour, which has persisted ever since the Spanish conquest. This and other important subjects, including climatic handicaps, national debt, railways, roads, agriculture, trade,

WHAT THE GENTLEMAN OF THE EARLY NINETEENTH CENTURY WORE!



THE ALE YOUR GREAT-GRANDFATHER DRANK

immigration, education, and social life, are all analysed, in preparation as it were, for the logical deductions in that carefully thought-out final chapter, "If I were dictator."

To students, whether of Central America in particular or of world affairs in general, this work is a timely publication, as it can be read in the light of the facts that no country can escape the influence of the present great war and the new world order which will be its aftermath.

T. L.

Building The Canadian West

The Land and Colonization Policies of The Canadian Pacific Railway by JAMES B. HEDGES, Professor of American History, Brown University. (The MacMillan Company, New York, 1939).

This book is the outgrowth of the author's earlier studies of the influence of the railway upon the northern states of the United States. Those investigations aroused his interest in the role played by that same agency to the north of the 49th parallel, where, in the Prairie Provinces, approximately one-fifth of the total land area alienated by the Dominion Government was granted to the Canadian Pacific and its subsidiaries.

Beginning with the principle that the most important feature of the economic life in a colony or a newly settled community, and upon which more than any other depends its prosperity, is its commercial connection with the rest of the world, the author tells us of the conditions existing in the western plains before the railway first came to the Canadian Prairies. He describes, in great detail, the evolution of the West from the time of the Selkirk settlement in 1812 to the present day; he draws a clear picture of the struggle of the first settlers impeded as they were by lack of communication, and shows us the coming of the railway and the onward rush of the homesteader who settled sometimes at a substantial distance ahead of the constructed line, knowing that where they would go the railway would follow.

We are then led through the intricacies of the land subsidy policy which, after ten years of discussion and political controversy, ended in a definite plan by which the Canadian Pacific Syndicate received a cash subsidy of $25,000,000, a land grant of 25,000,000 acres, and assumed the tremendous responsibility of completing the Transcontinental Railway.

The author next deals with the problem of selecting the railway's land which had to be "fairly fit for settlement", and the difficulties of administering such a vast landed estate. He tells us the efforts made to sell the land to actual settlers, and describes the advertising campaign which was started in Great Britain and spread all over Northern Europe.

Then came the year 1896 which will ever occupy a conspicuous place in the history of the settlement of the Canadian West and mark the termination of an era and the beginning of another. He shows us the Government beginning to assume an increasingly vigorous and aggressive attitude towards the problem of filling up the open spaces on the prairies, an undertaking that was made possible by the presence of the railway which established a favourable ratio between the price of wheat and the cost of transportation. He touches upon the importance of the propaganda of the Dominion Government's agents in giving stimulus to the exodus of the American farmers to the North-western Provinces which culminated in a land boom on the prairie, and states that the rush of the settlers was such that homestead entries increased from 1,867 in 1896 to 41,869 in 1906.

We then come to the irrigation project, the formation of the Alberta Railway and Irrigation Company, and the Canadian Pacific Irrigation Company, and the efforts made to establish suitable settlers on irrigated land.

This was followed by later land policies and the promotion of better agriculture: encouragement was given to sugar-beet production, development of dry and mixed farming, importation of good stock from Eastern Canada, inauguration of the loan for live-stock policy, and a campaign for the destruction of noxious weeds.

The author brings his book to a close with a study of the problem of colonization which includes the creation by the Canadian Pacific of a Department of Colonization and Development, the immigration of Mennonites from Russia, and the founding of societies to be responsible for the welfare of immigrants.

This book is a clear and exhaustive study of the importance of the role played by the Canadian Pacific Railway in the development of Western Canada. It contains a wealth of information which was obtained mostly from the archives of the Canadian Pacific Railway, from the Dominion Land Board of the Department of the Interior and from the Parliamentary Library. It is not only an interesting book; it is also a reference book which should be found in every important library.

J. H.

Serial Map Service, (George Philip & Son, Ltd.,) London.

Serial Map Service consists of a series of excellent maps with commentaries on the countries of the European War Zone and its outlying spheres of contact.

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D. A. NICHOLS.